The BOOK *of* TREES

ALFRED C. HOTTES

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An outstanding tree, the Ginkgo bears unusual fan-shaped leaves. It is extremely upright when young, but its supple branches bend easily, and with age the tree becomes very arching in form.

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THE BOOK OF TREES

By
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PREFACE

THIS "Book of Trees" is intended for the amateur, the gardener, and the nurseryman, but it makes no pretense of appealing to foresters. The trees are discussed from the viewpoint of a horticulturist, not a botanist.

When every boy and girl in the United States are taught to appreciate and plant trees, there will be little question that in the future, streets will be tree-lined and the roadsides will be gay with blossoms and ornamental fruits.

The writer is indebted to scores of persons, practical tree men and scientists, who have determined current practice in the care of trees. He is indebted for the botany of trees to Rehder's "Manual of Cultivated Trees and Shrubs," and to Bailey's "Manual of Cultivated Plants," and "Hortus Second". Only such trees and their varieties are discussed which have some ornamental value. An attempt has been made to include the commonest trees worthy of being grown throughout the United States.

Numerous friends have been willing to assist, among them: Martin L. Davey, F. A. Bartlett, Prof. Ralph Rothacker, Phyllis Stevens and Charles Irish. To "Better Homes and Gardens" and the "Florists Exchange and Horticultural Trade World" especially, and to many other publications I am indebted for the use of articles and illustrations.

ALFRED C. HOTTES.

Chapter I

WHY WE PLANT TREES

1. We plant trees because we love them. Some trees linger in our memories as old friends, from whose branches we have swung and "skinned-the-cat"; under whose cool shade we have rested from play or work. Some trees seem to have moods, changing from day to day, season to season, and from youth to old age.

2. We plant trees for their beauty of leaf, whether green in Summer or red in the Autumn; for their bark which becomes particularly fascinating in Winter; for the delicate tracery of the branches which frame our view of the eternal blue or star-scattered heavens; for their flowers which seem like giant nosegays.

3. We plant trees to shelter our homes from the Summer sun and from the cold sweeping winds of Winter.

4. We enjoy a touch of Nature to form a background and a frame for our architecture.

5. We plant trees to furnish leaf cloisters for the birds which awaken us from our too-late slumbers when all the world of Nature, except ourselves, is awake.

The birds pay a liberal rent to the tree in the form of the hordes of insects which they devour. Where would our gardens of fruits, flowers, and vegetables be if it were not for the vigilant birds which catch more than we could spray?

6. We plant trees because, where they expand their verdant branches the air is purer and less dusty. The medical societies are constantly advocating the planting of city trees to temper the heat of Summer on the torrid pavements.

7. We plant forests that floods may be prevented; that fertile soil shall not be carried to the valleys below; that rainfall may be regulated.

8. We plant trees for their economic use—lumber, furniture, turpentine, rubber, quinine, nuts, cork, paper, windbreaks and one thousand and one uses for which we have as yet found no substitute.

9. We plant avenues of trees in cities and along the roadsides because we believe that no road or street is dressed or finished until it has been planted to furnish shade, frame vistas of outlying beauty, and prevent snowdrifts.

Aside from this aesthetic and civic value, the realtor knows that trees increase the value of property. Business on a tree-bordered avenue is likely to be brisker than on a sun-parched thoroughfare.

10. Some of us plant trees that we may be silent witnesses to the life processes of the tree.

We enjoy pruning a tree to our whims, improving its fruits by breeding, and its vigor by supplying plant food.

We are interested in a tree for pure botanical and horticultural reasons. The strength of its woody fibers, the incomparable complexity of its flowers, the abundance of its fruit, and the growth processes fascinate us.

We take joy in supplying a fit environment for a growth that approaches perfection.

Chapter II

WHAT IS A TREE?

GREEN plants possess a mighty substance known as chlorophyl. The air is constantly filled with carbon dioxide, which results from decay of all vegetation, and is the gas which we exhale. In the presence of sunlight, from the gases which are noxious to us, a tree manufactures starch. It transforms this starch to sugar. Starch is not soluble in water, so that without the transformation to sugar, the food cannot be transported to the various parts of the tree.

We see, then, how mighty chlorophyl is, for it is the most efficient transformer of the energy of the sun. It is, of course, chlorophyl which makes it possible for a plant to feed its twigs, bark, flowers, and roots.

In all plants, the food manufactured by chlorophyl is transformed into starches, but in trees and shrubs there is also a transformation into woody fiber. A woody trunk and strongly constructed branches elevate the crown of a tree high into the heavens.

TREES VS. SHRUBS

We can answer the question "What is a tree?" in another way. The simplest definition is that a tree is a woody plant which grows from its upper buds. We understand this definition by contrasting trees with shrubs.

Shrubs are such woody plants which increase in size by producing shoots from the base at regular intervals. The older shoots are gradually exhausted and must be removed. Therefore, some shrubs remain low and never attain great height. On the other hand, a tree, growing as it does, from its upper buds, has little tendency to sprout from its roots. It is true that many trees produce suckers of this sort, especially when their roots are injured.

A tree makes most of its growth by producing branches which lift it higher and higher above the soil. There are many gradations between trees and shrubs, and sometimes we have difficulty in saying whether a Flowering Dogwood is a tree or a shrub. We know that it is possible to prune the suckers and lower branches from such shrubs as the common Lilacs and make them treelike. Conversely, we can cut a White Poplar or a Purple-leaf Plum to the ground each year and produce a shrub.

The strong, gnarled arms of the Bur Oak stretch out imploring hands for a covering of snow

The Oldest Living Things

No living thing is older than a tree. In the permanency and the strength of its wood lies the secret of the tree's longevity. The ancient trees of the world have passed silently through the events of history and have obviously left no record except the rings of annual growth.

One reads with great interest stories told by Loudon in his "Arboretum et Fruticetum Britannicum." He tells us that in cutting down some Oak trees in the Sherwood Forest, letters were found carved within the wood. In one tree cut down in 1786 were found J. R., supposed to signify James Rex; and in another, W. M. with a crown, for William and Mary; and in a third, Joh. Rex, with several marks something like the old crown in prints of King John. The letters were about one foot within the tree, and above one foot from the center.

Of course, we have all noted how trees gradually encase objects such as wires or a fence or street signs. So there are many stories extant of finding crucifixes and other similar objects grown into wood.

We do not realize the size of the Bigtrees until we discover the man on horseback in the center of the picture. This is a veritable giant's garden.—(By courtesy of the Save-the-Redwood League)

Section of the Bigtree "Mark Twain" in the American Museum of Natural History, New York. The section measures 16½ ft. in diameter inside the bark and was cut from the tree 12 ft. above the ground. The tree grew in Fresno County, California, and was 1,341 years old when it was cut. It is fascinating to imagine the events of history which have transpired during the life of this tree. How the audience of this drama and tragedy of life has changed! How bravely this tree has grown through drought and adversity, silently adding branches and leaves!—(Courtesy of the Carnegie Institute)

Giants of the Earth

I was never more impressed with so profound a veneration for the age of trees as when I stood one day at the British Museum of Natural History and studied a block from one of the giant Sequoias, the Bigtree of California. Here were countless rings of annual growth. Some of them were labeled, and I realized that this tree was a seedling at the beginning of the Middle Ages.

R. J. Drumm has been good enough to give me the definite facts about this tree:

Ring	*Year*	*Historical Event*
	557	Justinian I, Emperor of the Eastern Empire; beginning of so-called Middle Ages.
43	600	Rome at her lowest state.
65	622	Flight of Mahomet from Mecca, beginning ot fhe Hegira or Mahometan Era.
80	637	Jerusalem taken by Saracens.
140	697	The first Doge of Venice.
174	731	The first independent Pope, Gregory III.
243	800	Charlemagne crowned Emperor of Rome.
314	871	Accession of Alfred the Great.
380	937	Athelstan's great victory over the Danes.
404	961	Dunstan, Archbishop of Canterbury.
457	1014	London Bridge built.
509	1066	Norman Conquest.
543	1100	Accession of Henry I.
612	1169	Strongbow invades Ireland.
658	1215	Magna Charta granted.
708	1265	Birth of Dante.
757	1314	Battle of Bannockburn
789	1346	Battle of Crecy.
858	1415	Battle of Agincourt
898	1455	War of the Roses begins.
943	1500	Close of the thousand years, called Middle Ages
978	1535	First English Bible printed.
1031	1588	Spanish Armada destroyed.
1059	1616	Death of Shakespeare.
1109	1666	Great Fire of London.
1150	1707	Union of England and Scotland as Great Britain.
1163	1720	Collapse of South Sea Bubble.
1202	1759	British Museum opened.
1244	1801	Union of Great Britain and Ireland.
1324	1881	Natural History Museum opened.

These Giant Redwoods (*Sequoia gigantea*) attain a height of over 300 ft. and a diameter of 30 to 35 ft. at their base, the tallest being the Founder's tree at Dyerville, California—364 ft. tall. Conservative estimates state that the age of these trees is perhaps 1100 to 2400 years old. For a more complete discussion of the Sequoias, see page 399.

The tallest foreign tree is the Giant Gum, or Peppermint Gum (*Eucalyptus amygdalina regnans*) of Victoria, 325 ft. tall.

The Banyantree (*Ficus begalensis*) an East India Fig or Rubber, produces shoots which drop from the branches to the soil where they

root to form prop trunks. In time the tree spreads over vast areas. One such tree is said to have 3000 trunks with room for 7000 persons to stand under its shelter. Such trees were used as market places. "Banyan" is the Hindu for "merchant".

According to Henri Faber, in "Wonder Book of Plant Life," the largest Chestnut tree grows on the slopes of Etna in Sicily. It is known as the Chestnut Tree of One Hundred Horses, because Joan, Queen of Aragon, having come to see the volcano, was surprised by a sudden storm and took shelter beneath the tree with the one hundred horsemen who formed her escort. Beneath its foliage, a forest in itself, both men and horses found abundant shelter. Thirty men, holding hands, would not quite succeed in surrounding this giant; the circumference of its trunk is more than 160 ft. In the matter of bulk, the trunk of this mighty tree is something more than a trunk; it is a tower —a veritable fortress.

The oldest tree in the world is said to be a Baldcypress at Santa Maria del Tule, Mexico. It is said to be 4000 years old and the trunk has a circumference of 125 ft.

Almost a News Item

There is a story by L. Pearsall Smith, in which he tells us that:

There is a great tree in Sussex whose cloud of thin foliage floats high in the summer air. The thrush sings in it, and blackbirds, which fill the late decorative sunshine with a shimmer of golden sound. There the nightingale finds her green cloister, and on those branches sometimes, like a great fruit, hangs the lemon-colored moon. In the glare of August, when all the world is faint with heat, there is always a breeze in those cool recesses, always a noise, like the noise of water, among its lightly hung leaves. The owner of this tree lives in London, reading books.

This is not a fairy story —it is almost a news item. Today we could write several items with such captions as these: "Wealthy tree owner spades garden plot while an 80-year-old tree is dying of borers," "Noted painter of landscapes is abroad, allowing his oldest elms to remain at home to be devoured by beetles," or again, "Ignorant workman cuts top from tree after it has been growing for 50 years," but I dare not carry this too far lest you lose my point and think me absurd.

Chapter III

THE STORIES OF THE TWIGS

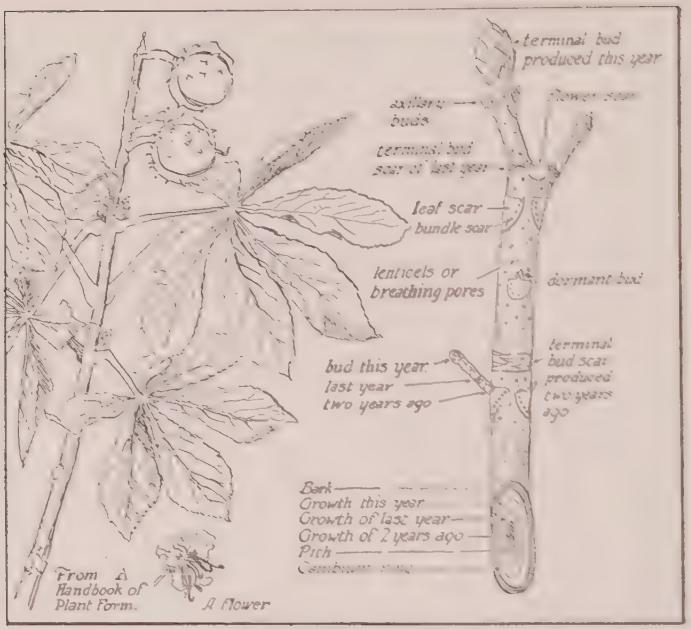
WHETHER we examine a twig in Summer or Winter, there is a story which any twig could tell us if we would but read it. Let me tell you the story of a Horsechestnut twig in the hopes that you will be interested in reading stories in Beech twigs, in Oaks, or perhaps the Sumac.

We have said before that there are all gradations between plants which we call trees and shrubs, so that there are gradations between those plants which produce wood and those which merely have a structure which is easily killed by the first frost of Autumn. There are trees which seem to know that Winter is coming and make preparations to protect their buds against its severity. On the other hand, there are other trees which do not make such preparation for Winter, either by protecting their buds with furry coats or by going to rest early enough in the season to stop the flow of their sap in order to make the ends of the twigs hardy enough to tolerate Winter's adverse conditions.

If we look at our Horsechestnut twig in the Winter we cannot help but marvel at its preparation for Winter. The tip bud, which we call the *terminal bud*, was produced as early as last July. Since that time it has merely been growing a thick cottony cover for its tender rudimentary leaves. It has covered itself with a sticky, waterproof cement so that, come what may, the tender leaf shoot and the potential flower are snugly protected against cold and rain.

Should something injure this large terminal bud, there are many other buds, arranged in pairs up and down the twig, which can easily take the place of the terminal buds without delay.

Some of these larger buds are formed the previous year, but even the large, shield-shaped scars have the potentiality of producing a bud to continue the growth of its particular branch. We can conceive of the twig as being an essential part of the tree. It would almost seem to have an inborn duty to carry out its part in keeping the top of the tree symmetrical and furnished with foliage which arranges itself in the proper angle to receive the maximum amount of sunlight and air.



THE HORSECHESTNUT

Can you read the whole story which the twigs tell? Are they as familiar to you in Winter as they are in Summer?

Let us look at these scars a little more closely. They are the *leaf scars* where the leaves were attached last year. On each one we find a number of tiny dots called *bundle scars*. These are the sealed ends of the food system which conducted the starch from the leaves to the twig, and carried water and other chemicals to the leaves to manufacture the starch.

Should our twig be three years old, as the one shown in illustration on this page, we will note several other interesting features. The strong shoot at the top obtained most of the food and rather starved its weaker brothers. Where the two twigs meet we may see another scar. This is the place from which the flower and fruiting stem dropped during the Winter. Each of the succeeding buds down this twig are smaller, but each one could start to grow if the ones above them were destroyed in any way.

This leads us to know why we can prune trees quite severely without worrying that they will not be able to sprout new branches.

Plants often start to grow from places where at present no buds are found. We refer to such buds as *adventitious buds*. If you would refer to your dictionary you would find that "adventitious" means "not inherent, accidental, or casual," so we may call these casual buds, for they are formed without order or in unusual places.

Should we examine our Horsechestnut tree, we would find that the buds are regularly *opposite* each other; whereas, in a Catalpa we would find that there are not only two which are opposite but sometimes three. If, on the other hand, we were to look at the Poplar tree, we would find that these buds are *alternate*. In almost every tree, botanists have worked out definite formulae for the arrangement of these buds, because there is no accidental chance in the arrangement of most buds.

Carolina Poplar

An interesting fact to know about trees is that there are few hardy trees with opposite buds; namely, Flowering Dogwoods, which, of course, always have rather zigzag branches, and the flowering buds look like a small shoe button on the end of each branch; the Horsechestnut and other Buckeyes, which have twigs large in diameter and with the large terminal bud which we mentioned above; the Maple, which has a rather narrow leaf scar and only three bundle scars; and the Ash, which has a more or less shield-shaped leaf scar, with the bundle scars in a U-shaped line, which cannot be easily counted. Of course, there are a number of exotic trees with opposite leaves which one sees but rarely, but if you are in a woods and you find a tree with opposite leaves, it is most likely to be one of these four trees.

Let us look again at our Horsechestnut twig, for we have not read all the story. We will find that this twig is three years old, and this we know because we can see the scars left by the scales of each of the terminal buds. And if we look at a cross section of the twig, we can see the rings of annual growth clearly marked.

I would suggest that you examine the twigs of many of your trees so that you may read how fascinating the stories are. Look at the Elm twig and note that the bundle scars are embedded deeply in the leaf scars, thus differing from the Hackberry, which otherwise resembles the Elm in Winter.

Examine a twig of the Kentucky Coffeetree and you will smile, for you realize that these twigs look as if they had had a coat of white

paint several years ago and need another. Examine the terminal bud of a Hickory, for here the bud scales seem to grow right out of the twig and merge into the bud itself. Study an Oak twig, for no matter what kind of an Oak twig you pick up, you will find that the buds are clustered together at the tip and that the pith inside the twig is arranged in the shape of a star. (See page 318.)

Look at the Planetree or Sycamore and you will see that the end of the leaf stem is hollow and fits over the cone-shaped bud like a cap. Examine a Locust and note how the bud is not visible but has to burst the leaf scar in order to start growth in the Spring. Note that the flower buds of an Apple tree and a Cherry are produced on short spurs, which we call fruit spurs. Examine the twigs of the Butternut, the Black Walnut, or the Empress-tree, and you will note that the pith has partitions.

To our fathers the tree was a cumberer of the ground. To our children it will be one of the most valuable of assets. Upon us who live in the transition period between these two extremes devolves the difficult task of breaking away from traditional habits of thought and adapting ourselves and our methods to new and radically different conceptions.—Edmund Secrest.

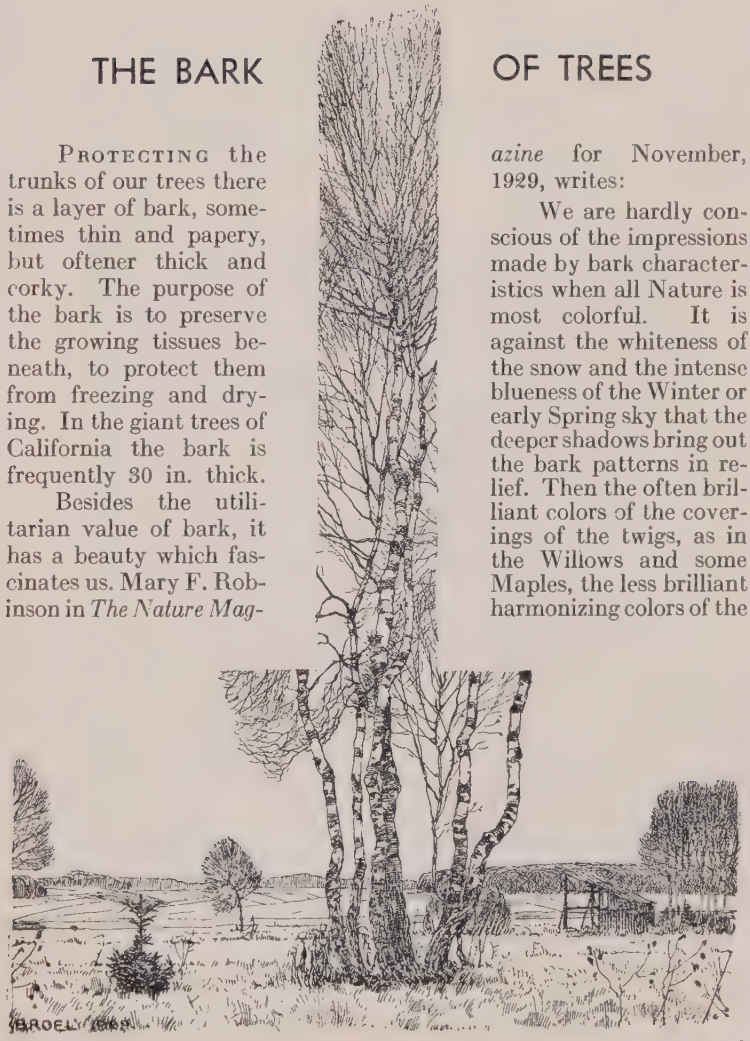
Chapter IV

THE BARK OF TREES

PROTECTING the trunks of our trees there is a layer of bark, sometimes thin and papery, but oftener thick and corky. The purpose of the bark is to preserve the growing tissues beneath, to protect them from freezing and drying. In the giant trees of California the bark is frequently 30 in. thick.

Besides the utilitarian value of bark, it has a beauty which fascinates us. Mary F. Robinson in *The Nature Magazine* for November, 1929, writes:

We are hardly conscious of the impressions made by bark characteristics when all Nature is most colorful. It is against the whiteness of the snow and the intense blueness of the Winter or early Spring sky that the deeper shadows bring out the bark patterns in relief. Then the often brilliant colors of the coverings of the twigs, as in the Willows and some Maples, the less brilliant harmonizing colors of the



smooth, larger branches, and the delicate gradations of color to the warm and varied tones of gray in the smooth or sculptured surface of the older hardwoods, are enhanced. There, in the silence of the woods while Nature sleeps, come deeper thoughts, and we sense that almost indescribable beauty of tree barks.

The surface that we see in the trunk and branches is dead and, somewhat like the surface of rocks, it weathers away. Rough barks, which crack and split as the tree increases in girth—like those of Oaks, Elms, Ashes, Maples, Horsechestnut, and Hickories—shed at times during the weathering the characteristically shaped fragments—flakes, scales, or straplike plates. The smooth barks like those of the Beech and Yellow-wood, which are capable of great distension as the tree grows, weather away without noticeable signs, but some

Note the characteristic bark of the Black Walnut with its deeply furrowed surface with rounded ridges

others belonging to the Birches sometimes visibly peel off in very thin layers as the weathering progresses. Barks vary in thickness, but when a tree is classed as "standard" in size (one foot to two feet in diameter) by the woodsman the weathering keeps pace with the new growth so that the depth down to the growing layer, or cambium, remains about the same for the rest of the tree's life.

The Oaks, Elms, and some Maples, and Persimmons have notably rough bark. The White Ash is also rough, but it is so regularly and neatly furrowed that it seems to make a regular design upon the trunks. In the Persimmon, the bark cracks regularly, horizontally and vertically, to form a square pattern of flat knobs. The Maples shed their bark in large strips and the Shagbark Hickory appears utterly disreputable in its ragged clothing. In the Kentucky Coffeetree the bark-flakes are attached at one side and seem to roll from the trunks.

The bark of the Striped Maple, Acer pennsylvanicum, is a pleasant feature of the Winter landscape

Beech bark appears speckled with black pits but in the distance seems to be smooth. The American Hornbeam trunks, though small, are sinewy like the wrists of a man. The Birches often have silky bark which clings like a kid glove to the trunk and with age splits to peel back horizontally. Some sorts of Birch are pink, golden-yellow and even orange beneath the weathered exterior. How tattered is the bark of the Yellow Birch! Like sheets of parchment the Plane-tree and the Madrone shed their bark.

But in the Crape-myrtle and the Stewartia the bark with age becomes very smooth and appears polished.

Some trees are sensitive to bark injury, notably Holly, Laburnum, and the Striped Maple. Apparently the bark cannot heal in these trees.

It is usually advised to transplant the smooth and thin bark trees, such as the Beech, the Tuliptree and Magnolias in Spring, as their protective bark layers, being thin, they are more susceptible to sun injury during the Winter.

Chapter V

THE MYSTERY OF AN AUTUMN LEAF*

Someone has written:

To the artist, the falling leaf of the deciduous tree is a thing of beauty; to the small boy, whose chore it is to rake the garden, it is only a nuisance; to the chemist it represents a marvelous achievement that he could not duplicate in his laboratory, however earnestly he tried; and to the food economist and statistician every brilliant red and every rich brown represents a waste of saccharine substance that in the aggregate would be sufficient to sweeten the coffee of the world.

What Autumn Leaves mean to us depends upon our point of view.

Dr. J. Arthur Thompson, in his "Bible of Nature," writes:

We ascend a hill among the woods on an Autumn afternoon, and we look down upon a sea of gold mingled with fire—all the glory of the withering leaves. Our botanical friend tells us of the breaking up of the green grains into chlorophyl and xanthophyl, how the latter is affected by the acidity of the cell sap, how a special death pigment, anthocyanin, may make its appearance, and so on; all the glory seems to fade into chemistry.

But if we question the botanist a little we find that he has given us more than we have lost. We see that the hard-worked leaves must die, that it is better for the tree that they fall, that they first surrender what they have that is worth having, till little more than skeleton and waste is left, that they are transfigured in dying, and that their brilliance is a literal beauty for ashes.

*This first appeared in *Better Homes and Gardens*, October, 1929

The leaves have been working all Summer absorbing carbon dioxide and certain minerals from the soil. Perhaps you will say, "Working? You mean absorbing. A plant does not really work." Of course, a plant does. Does a cow which gives a bucket of milk work less than a horse which trots a mile? Does not a leaf work? Do not the leaves become aged even as we? Even as you, each leaf is a worker, contributing its bit to the building of the tree, to the opening of the blossoms, and to the ripening of the fruit or the seed.

Understanding all the facts about leaves, we are left to wonder why the Dogwood turns red and not violet; why one section of a Sassafras leaf is red, whereas the remainder of the leaf is yellow; why the Sumac changes early; why the Oak leaves do not fall; why the Honeysuckle keeps the vivid green of Summer; why some leaves taste bitter; why some leaves are smooth and others furry; why some are nutritious and others are poisonous—a hundred other questions arise.

Thoreau has written:

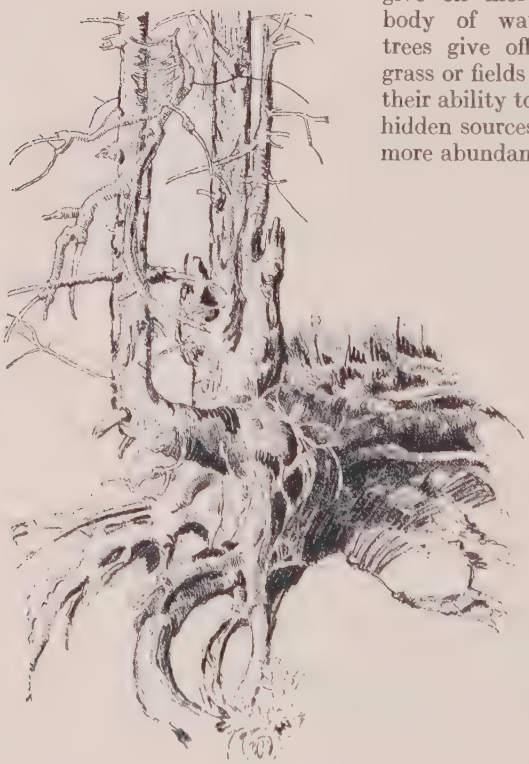
Already by the first of September I had seen two or three small Maples turned scarlet across the pond, beneath where the white stems of three Aspens diverged, at the point of a promonotory, next the water. Ah, many a tale their color told! And gradually from week to week the character of each tree came out and it admired itself reflected in the smooth mirror of the lake. Each morning the manager of this gallery substituted some new picture, distinguished by more brilliant or harmonious coloring, for the old upon the walls.

Autumn leaves! You puzzle us, you charm us, blow into our faces, and protect our gardens.

Chapter VI

TREES AND EROSION

TREES give off quantities of water to the air, thereby increasing the humidity which eventually results in rain. Someone has called trees "The Oceans of the Continent." Individual trees give off as much as a barrel of water by transpiration every twenty-four hours. Scientists tell us that trees give off more moisture than a body of water. Furthermore, trees give off more water than grass or fields of grain, because of their ability to tap the deeper and hidden sources of water and their more abundant leafage.



Trees prevent erosion of soil and prevent the damage due to floods. From a friend I received a clipping which reads:

Some people say that the Chiese revolution was due to the absence of trees in that unfortunate country. There is a sound foundation for this belief in the fact that the restlessness of a people has often been traced to the

scarcity of fertile land, and the consequent dearth of food. The rivers of China have gradually washed away a great part of the precious topsoil that the destroyed trees lived centuries to manufacture, and which they would have protected from flood had they been preserved.

The beauty of a tree is plain to be seen, but the hidden complexities of this natural manufacturing plant are seldom appreciated, either by the gardener who blindly uses tree products, or by the apartment dweller who seeks the coolness created by park trees.

Chapter VII

SOME WONDERFUL TREES*

TREES have always interested and even fascinated mankind. Dr. William V. Kelley writes that "The Bethsaida blind man who midway in his healing said to Jesus, 'I see men as trees walking' suggests that trees and men are not so unlike each other!"

There is a wonderful difference of disposition among trees. Certain trees are found in groups, while others stand apart. Of that which cultivates reserve and independence the Elm is first. The tranquil lordship of one Elm tree made George William Curtis write, one New England afternoon: "A stately Elm is the archbishop of this green diocese. His flowing robes fill the air with grace. He rules the landscape round here!"

Of Thoreau, Emerson said: "As for taking his arm, I would as soon think of taking hold of an Elm tree."

J. R. Lowell declared: "I care more for my trees than for my books," and literature contains few more felicitous figures of speech than Lowell's description of a loyal friendship: "A friendship covering forty years is the finest kind of shade tree I know of."

When the statue of Horace Greeley was unveiled in New York City, his daughter placed on the statue a wreath of Oak leaves from the trees near his old home with these words inscribed: "The trees send greeting to one who loved them."

John Ruskin affirmed that, "No man can be far wrong in temper of mind who really loves trees."

There are many curious trees. The Sticky Tree of New Zealand, which catches flies and birds. The Sneezewood Tree of Natal, South Africa, is so called because one cannot see it without sneezing violently!

The Butter Tree of Senegal produces a nut containing vegetable butter. The Sugar Tree or Douglas-fir tree of British Columbia produces a rare kind of sugar. The sugar is found among the leaves in lumps, and is very pleasant to the taste. The Water Tree of the Australian desert is the Mallee tree which yields quantities of pure water.

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*This is quoted from *Outdoor America*, October, 1929 by W. J. Thompson.

The Blanket Tree of Ecuador is true to its name. When an Ecuador Indian wants a blanket, he hunts up a Demajagua tree and takes from it a six-foot section of its peculiar soft bark which gives a blanket of soft texture and will last for several years.

The Cork Tree of Portugal is well known. The Singing Tree of the West Indies sings in a low key as the wind blows through its leaves. Southern California also has its singing trees, not far from Topango Canon. The Stinging Tree of Queensland is very beautiful, but stings worse than a bee. The Iron Tree of Africa is also true to its name; if you want a leaf you must file it off!

Then there is the Illuminated Tree in India. In the darkest night this tree can be seen a mile distant!

The Angry Acacia of Nevada quivers violently when disturbed and emits an unpleasant odor. It takes this bad tempered tree an hour or two to go back to good humor.

The most distinguished tree in the United States is a tree that owns itself. It is a White Oak tree in Athens, Georgia. No one can buy or sell it. No one owns the land on which it stands rooted. The man who owned the tree left this provision in his will: "In consideration of the great love I bear this tree and the great desire I have for its protection for all time, I convey to it entire possession of itself, and all land on eight feet of the tree on all sides."

At Woolthorpe, Lincolnshire, England, an aged Apple tree was cut down in 1820 to preserve its wood from decay because 150 years previous a young man of 23, Isaac Newton, lay at its feet and caught one of God's greatest secrets when this tree dropped an Apple. Abbie Brown tells us: "I lay at the foot of an ancient tree and let God's universe talk to me."

The Bible is full of trees. At its opening in Genesis stands the Tree of Knowledge, and at its close in Revelation stands the Tree of Life, while in the books between Genesis and Revelation are trees innumerable.

Chapter VIII

THE TREES OF AMERICAN HISTORY

MANY of the trees most revered in our early history, having attained a ripe old age, are now dead. Even so, the part played by some of these trees in the story of our country will be retold for another century or two.

THE WASHINGTON ELM. The Washington Elm, which stood in Cambridge, Massachusetts, died, but a tablet marks the spot where it grew. At its death the Elm was considered to be 200 years old. Even in 1744 it was a tree chosen by George Whitfield as the place for his Methodist meetings after he was refused admittance by the colleges and churches of New England. Washington took command of his army under this Elm, July 3, 1775. It was 41 ft. high and the trunk was 14 ft. 2 in. in circumference. It might have lived longer had it not suffered from injury by gas, water and sewer pipes.

JOHN BARTRAM. To the plant lover John Bartram's garden in Philadelphia is noted. It is America's first botanical garden. For years a huge Baldcypress stood in this garden. E. S. Williams tells us:

It is a matter for congratulation that some of this garden remains, though all the smaller plants have long since passed away. Here slips of trees sent from far countries were set out and watched with anxious solicitude. Here was a collection of American trees gathered by the botanist during his long forest journeys north and south, such as no one else in the country thought of making either then or for many years afterward. One remarkable tree in this garden was the great Baldcypress (*Taxodium distichum*). This species of Baldcypress is remarkable in that it is deciduous, shedding not only its leaves but its little branches each Autumn. It is said that John Bartram while on a journey through the Florida swamps lost his whip, and in looking for a switch saw a small sapling growing erect by the riverside. He stopped and pulled it up by the roots, but instead of using it for a whip, he put it in his saddlebag and brought it home, planting it in the northern part of his garden, predicting at the time that it would grow to an immense height. The tree was probably planted about 1740, and although it lived until after 1890, probably dying of old age, it attained a height of 175 ft., and was left for many years as a feature of Bartram's garden.

Under the Emancipation Oak the first negro children were taught—(Courtesy of Hampton Institute)

The Emancipation Oak. Located between Old Point Comfort and Hampton, Virginia, there is an Oak which is estimated to be from 300 to 500 years old. Miss Emily K. Herron tells us:

Under this tree the first class of children of the emancipated blacks was taught by an educated member of their own race—Mrs. Mary Peake. Later, a large schoolhouse was built for them near the Oak, by command of General Butler, and named for him, the Butler School. This was the nucleus of the Whittier School of today.

The tree is now in perfect condition, and no particular care has been necessary to preserve it. This is probably due in part to the fact that the tree stands in the middle of a cultivated field, and the tilling of the field has in itself preserved the tree.

The Oak is now about 45 ft. high and the spread of the branches is 65 ft. The base is 12 ft. in circumference. It is the common Live Oak (*Quercus virginiana*) of the Southern States. Old Point Comfort is said to be the northern limit of this species.

William Penn Elm. The famous William Penn Elm was blown down in 1810 at the age of 233 years. It is the tree under which Penn made his treaty with nineteen tribes of Indians, the only treaty never sworn to and never broken.

Annapolis Tuliptree. Lesser known is the Annapolis Tuliptree which served as a canopy under which the colonists and Indians made a treaty of peace. It stands on St. John's College campus. E. S. Williams says:

This treaty was probably the one agreed upon between the colonists and the Susquehannocks in 1652. If in 1652 it was of such imposing growth that it was selected as the scene of such an event, may we not infer it lived before Columbus saw America?

Recent measurements 2 ft. from the ground make it 32 ft. 4 in. in circumference, and about 150 ft. high.

One third of the trunk is gone and is now boarded up. The body is a mere shell, but in spite of this its life is well maintained.

About 1840 several youths playing under this tree, ignited about two pounds of gunpowder in the hollow and set fire to the tree.

The tree had then fallen into a state of decay that threatened its life. The next year it put forth its branches with its youth renewed. The explosion had apparently destroyed the worms that were gnawing its vitals.

Nothing has been done in recent years toward the preservation of the tree, the general opinion being that it is best to leave it alone.

The following notes are derived from Edward C. Delano in *The Arbor Day Manual* for 1890, so it is possible that some of the trees mentioned are no longer standing:

Charter Oak. One of the best known trees in American history is the Charter Oak which stood in Hartford, Conn. until 1856 when it was blown down. This tree once preserved the written guarantee of the liberties of the then infant colony of Connecticut. In 1687 Governor Andros, whom King James had sent across the sea to be Governor of all New England, appeared before the Connecticut Assembly, then in session in Hartford, and demanded the Colony's charter. Tradition tells us that the charter was brought in and laid upon the table. In an instant all lights were extinguished and the room was wrapped in total darkness. Not a word was spoken. The candles were again lighted, but the charter had mysteriously disappeared; and though Sir Edmund searched diligently for it, his search was in vain. Captain James Wadsworth had seized the precious charter and concealed it in a hollow in the trunk of this friendly tree.

The Cary Tree. As Alice and Phoebe Cary were returning from school one day they found a small tree in the road. They dug the earth with sticks and their hands, and planted it. When these two children had grown to womanhood and removed to New York City, they never returned to their old home without paying a visit to the tree they had planted. That tree is the large and beautiful Sycamore, which one sees in passing along the Hamilton turnpike from College Hill to Mount Pleasant, Hamilton County, Ohio.

Washington Oak. A tree interesting from its association with the General of the American Army, is the Washington Oak at Fishkill. Washington's headquarters remained on the west bank of the Hudson, between Newburgh and New Windsor, from the Spring of 1782, to August 18, 1783; and during this time he crossed the river frequently for the purpose of visiting the troops in camp upon Fishkill Plain, near the village of that name. The most convenient landing-place on the east bank was upon a long, low point of land formed to the north of the mouth of Fishkill creek, and here, according to the tradition of the locality, under two large Oak trees, Washington always mounted and dismounted from his horse as he started and returned from the camp. The tree is a Chestnut Oak, and stands directly at the top of the low river bank. The trunk girths at the present time, over 21 ft., and, judging from the age of its companion, which was blown down a few years since, eight or ten centuries may have passed since the acorn from which it sprang fell to the ground.

Napoleon Willow. There is a Weeping Willow in Copp's burying ground near Bunker Hill, that has grown from a branch taken from a tree that shaded the grave of Napoleon at St. Helena. Under this tree are buried the remains of Cotton Mather, so noted in Salem witchcraft. Copp's burying ground is so near the Bunker Hill battlefield that a number of gravestones can be seen today which were pierced through by bullets fired by British soldiers in that battle.

Old Liberty Elm. It was the custom of our New England ancestors to plant trees in the early settlement of our country, and

dedicate them to liberty. Many of these "Liberty Trees," consecrated by our forefathers are still standing. Old Liberty Elm in Boston was planted by a schoolmaster long before the Revolutionary War, and dedicated by him to the independence of the Colonies. Around that tree, before the Revolution, the citizens of Boston and vicinity used to gather and listen to the advocates of our country's freedom. Around it during the war they met to offer up thanks and supplications to Almighty God for the success of the patriot armies, and after the terrible struggle had ended, the people were accustomed to assemble there year after year, in the shadow of that old tree, to celebrate the liberty and independence of our country. It stood till within a few years, a living monument of the patriotism of the people of Boston, and when at last it fell, the bells in all the churches of the city were tolled, and a feeling of sadness spread over the entire State.

Another noted tree is the wide spreading Oak tree of Flushing, Long Island, under which George Fox, the founder of the Society of Friends or Quakers, preached.

The Burgoyne Elm, at Albany, was planted on the day the British General Burgoyne was brought a prisoner into the city, the day after the surrender.

A magnificent Black Walnut tree, near Haverstraw on the Hudson, is pointed out as the one under which General Wayne mustered his force at midnight, preparatory to his successful attack on Stony Point.

A huge French Apple tree stands near Fort Wayne, Indiana, where Little Turtle, the great Miami Chief, gathered his warriors.

A grand Magnolia tree near Charleston, South Carolina, has been noted as a tree under which General Benjamin Lincoln held a council of war previous to surrendering the city.

"Famous Trees" by Charles E. Randall and D. Priscilla Edgerton. Misc. Pub. No. 295, U.S.D.A., 1938, gives a fuller discussion of the famous trees in each state.

Alexander and the Sailor Lad

An interesting American tree story deals with an Oak sent from Nicholas II, Czar of Russia, to Theodore Roosevelt. When Secretary of Interior Hitchcock left his post as Ambassador to Russia, he brought back with him a handful of acorns from a tree growing in the grounds of the Czar at St. Petersburg. These acorns came originally from a tree grown from an acorn secured at Mount Vernon, near the tomb of Washington. The acorn was planted by Alexander I, who was a tree lover and ardent admirer of George Washington.

Let us see what the beginning of this story really was. A. D. White, former president of Cornell University and former ambassador to Russia, related this story to Dr. B. T. Galloway:*

*From the *National Horticultural Magazine*, July, 1929.

Back in the days of Alexander I, one of the greatest of Russian rulers, we had a Minister representing our country who was something of an aristocrat and not a little inclined to exaggerate his own importance. One day the Minister had a visit from an American sailor lad, who had spent about ten days in an effort to come face to face with the man who represented the United States in this far-away land. The boy told the Minister that he was on leave from his ship and that he had an important gift he wanted to present in person to the Emperor. He explained that the gift consisted of a few acorns he had gathered at Mount Vernon and he wanted with all his heart to place them in the hands of the Emperor, who, he had been told, was a kindly man and loved Washington dearly. The Minister sat aghast at the effrontery of the boy for even proposing such a thing and proceeded to lecture him and Americans in general for lack of even the ordinary amenities governing such matters.

A day or two later the Minister was awakened by a great hubbub outside his window. The Minister had just got out of bed and when he looked out he rubbed his eyes, for he thought the Emperor himself must be calling on him. There was a resplendent outfit blazoning the Arms of the Emperor and filling a good part of the square. There was a carriage drawn by four beautiful black horses, and a number of beautifully mounted outriders. To top it off, there were soldiers and at least four dazzling footmen. While the Minister stood in his bathrobe, with mouth agape, the door of the carriage was opened by a bowing footman and our sailor boy stepped out, looking as unconcerned as if he had been accustomed to such things all his life. The Minister hurriedly dressed and rushed down to see what it was all about. He found the boy quite unconcerned. The lad told the Minister that the Emperor had very kindly placed the whole retinue outside at his disposal for the day, and that before seeing the sights of St. Petersburg he thought he would just drop around and pay an informal call.

"But," gasped the Minister, "how did you reach the Emperor?"

"Oh, that was easy!" remarked the boy. "After you turned me down, I wandered over by the palace gates and it just happened as I got there a kindly faced, military-looking man came out, and in a few words I told him my story. I even told him," naively remarked the boy, "what you said about the Emperor's inaccessibility."

The gentleman said, "Come with me, my lad, and I will see what can be done."

Gate after gate opened at the approach of the pair, and finally they reached a beautiful park. Here they found a kindly man walking among the trees, and the boy's guide, in a very informal way, introduced him as His Majesty, the Emperor.

The Emperor listened to the boy's simple story, simply told, and when it was finished he reached for the handful of acorns which the boy presented. He took them almost reverently and beckoned

for the boy and his guide to follow him. At a beautiful open spot in the palace grounds, the Emperor knelt and planted the nuts, and it was from the trees grown from those that Mr. Hitchcock secured his acorns.

Who can say what was in the mind of the kindly Emperor when he told the boy to return next day and he would be provided with the means of paying his respects to the American Minister, and seeing the sights of Russia's capital city?

Chapter IX

EVERGREENS

PERHAPS you have wondered about the true origin of evergreens. Entirely outside of botany there is this old story:

A tiny bird with a broken wing fluttered through the woods, trying to get assistance from the trees. But the Oaks were too busy with their acorns; the Birches were too proud to speak to anyone, and the Willows were too laden with their own grief to listen to other people's troubles. But the Fir said, "You may live in my branches." The Pine added, "If you do that, I will protect the Fir from the cold winds," and the Juniper promised bright berries for food.

By and by, Winter came and the North Wind asked if it might take the leaves from the trees, but Mother Nature answered, "You may take all the leaves except those that sheltered my poor injured bird." So that is why we have evergreens.

Edna Smith De Ran has expressed the charm of the evergreens in another way in her poem:

Lord, let me be a Pine that lifts
its hands up high
To grasp the subtle secrets of the
sky.
The Maples blush on lower spheres;
The Hemlocks bow their backs;
The Willows lean their heads to list
To whisperings of running brooks;
But, oh, the Pines do never tarry
in their climb
Up to the stars.
Lord, let me be a Pine.

The evergreens which we can discuss in this book, of course, are only the treelike sorts, which are used principally for windbreaks, specimen trees and for the taller specimens in foundation planting. Unfortunately, too many of the treelike evergreens have been used for foundation plants around the walls of our homes. Just at the time when the trees are beginning to show their characteristics they are too large for the situation. Nevertheless, I think we all enjoy specimen evergreens in our yards as the background of our garden pictures, because evergreens are permanent in their color. They serve as nesting places for Winter birds, and have always been considered as the most desirable of trees. Some of them are as easy to grow as the deciduous trees.

Evergreens vary greatly in their habit of growth so that we can choose an evergreen for every purpose. Some have more or less horizontal branches, as the Firs, Spruces and Douglas-firs. Such sorts make formal pyramids and columns in the landscape. Other conifers, such as the Pines and the True Cedars, are less formal in outline, and with age some of them become extremely picturesque.

Some evergreens give an extremely dense and black appearance in the landscape. For example, we have the Oriental Spruce, the Italian Cypress and some of the Yews. Other evergreens are very lacy and dainty in character, even though they be compact, as for example the Hemlocks and the True Cedars.

The reader who is interested in the broad range of evergreens which cannot be included in this book, should refer to L. H. Bailey's "Cultivated Evergreens," which deals with many of the dwarf, shrubby species, as well as the trees included in this book.

Conifers

Upon the approach of Winter, trees either shed their leaves, in which case they are called *deciduous* trees, or they hold their leaves for at least one Winter, in which case we call them *evergreens*. Some of the evergreens have broad leaves, which resemble the deciduous trees. The *conifers* bear cones, not flowers, and most of them hold their leaves throughout the Winter.

In most of the conifers the leaves are very different from those found in deciduous trees. They are long and needlelike, as in the Pines, Spruces and the Firs; or they may be short, awl-pointed, as found in many of the Junipers and Chamaecyparis; or sometimes the leaves are flat, scalelike, setting so closely together that the twig covered with leaves bears no resemblance to the deciduous trees because these leaves are so small and closely pressed against the branch.

Sometimes we cannot definitely say whether a tree is evergreen or not because in Southern climates the leaves are held on the plant throughout the Winter, and in Northern climates they are shed. An excellent example of this is the Sweetbay, *Magnolia glauca*, which is evergreen except in the North.

In the case of the White Pine, it makes an annual growth of needles and sheds the leaves of the previous season each year, so that when Winter comes, only the leaves of the previous year remain upon the tree. But this does not hold true with some of the other conifers. In the case of the Oriental Spruce the foliage is kept for seven years before being shed. Douglas-fir sheds every five years, and Austrian Pine every four years. Most of the evergreens lose a part of their foliage in the Fall, but some shed in the Spring. Two examples are the Japanese Yew and the American Holly.

The Groups of Evergreens

The conifers are known as gymnosperms because, unlike the flowering plants, their seeds are not inclosed in an ovary. Among the gymnosperms besides the evergreens, we are surprised to find the Ginkgo, an extremely primitive tree which does not bear a cone but produces an oval, plumlike fruit and fan-shaped leaves.

Included among the gymnosperms is the Yew family, the Taxaceae, which has needlelike leaves which form a flat spray of foliage. The fruit in this case is a bony seed surrounded by a rather fleshy, sometimes transparent pulp. The various genera of evergreens included in this family resemble each other very closely and differ only in technical botanical characteristics. It includes Podocarpus, Cephalotaxus, Torreya and Taxus.

The Pine family, the Pinaceae, on the other hand, has leaves which are needlelike or scalelike. They may be opposite, alternate or whorled. The fruit in this case is a woody cone with winged seeds, or in the Junipers the fruit is berrylike because the cone scales have exuded resin and produced a pulpy covering.

Included in the Pine family we have a great many conifers. A few of the principal sorts are Junipers, Cedars, Arborvitae, Redwood, Firs, Spruces, Hemlocks, Larches, Pines and Baldcypress.

Juvenile Forms

Within this family of Pines is a group of evergreens known as the Cupressinae, which include Juniperus, Cupressus, Chamaecyparis, Thuja and Libocedrus. Curiously enough, these evergreens vary so that in many cases we cannot give definite non-technical foliage characteristics by which we can surely determine their identity. In other words, most of them in growing from seed resemble some of the Juni-

pers in that they bear sharp-pointed awl-shaped leaves. But, as the plants grow older, some of them at maturity produce scalelike, close-fitting leaves, such as we find characteristic of Thuja.

Some species of Arborvitae, or Thuja, retain their juvenile appearance even after they are large and treelike. For instance, among the American Arborvitaes we have varieties which have flat sprays of scalelike foliage, which is the normal type, whereas such varieties as the low growing Heath Retinospora, which is *Thuja ericoides*, have scalelike leaves and resemble the Juniper, although the plants are not as prickly to the touch.

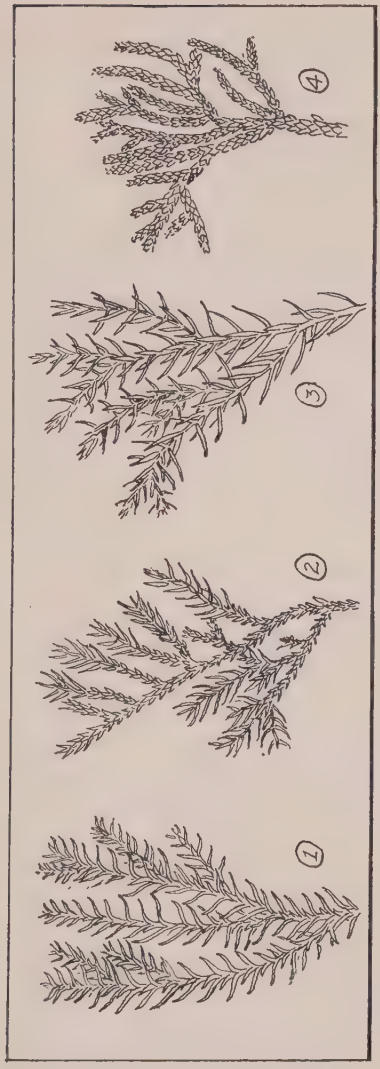
On the other hand, there is another variation known as the Threadleaf Arborvitae, *Thuja occidentalis filiformis*, in which the leaves, though scalelike, are produced on such elongated branchlets that the plant seems to be made up of partially unraveled cords.

A curious miniature form between the Arborvitae and the Junipers is known as the Tom Thumb Arborvitae, *Thuja occidentalis ellwangeriana*, which always has two kinds of leaves, adult scalelike leaves and juvenile sharp-pointed leaves.

The evergreens known as Chamaecyparis, or Retinospora, are quite intermediate between Junipers and Arborvitae, so that, superficially, we cannot give definite foliage characteristics by which we can always know them. It is interesting, however, to note that the Arborvitae have irregular cones with scales which are attached at the base as shingles are nailed to a roof. Chamaecyparis has more regular cones and the scales are attached in the center as the handle is attached to an umbrella, whereas, as previously stated, Junipers produce berries.

The presence of juvenile forms among plants is not confined to the conifers. Of course, the commonest examples of juvenile forms is found in the common Bean, which has simple leaves when it grows from seed, but the succeeding leaves become compound. In the English Ivy the leaves on young plants are distinctly angular and five-pointed, but from Philadelphia southward, where the English Ivy is at home and is not injured by freezing, the leaves become more circular and the branches do not cling to supports. This form is known as the Bush English Ivy, *Hedera helix arborescens*.

In the case of Japanese Wintercreeper, *Euonymus fortunei*, the characteristic form for the young stages is to have leaves which are small, seldom more than ¾ in. long, but as this grows older, clinging to a stone wall, the leaves become larger and wider, and in this form is known as the Bigleaf Wintercreeper or variety *vegeta*. From this stage it develops branches which have no ability to cling to the wall.



Juvenile Forms. These are all varieties of the Common Arborvitae. The first three sorts have foliage resembling the Junipers:

1, Thuja occidentalis decussata, Juniper leaved Arborvitae
2, T. o. ellwangeriana, Tom Thumb Arborvitae
3, T. o. ericoides, Heath Arborvitae
4, T. o. var. Little Gem

Whereupon, we give it an entirely different name and one variety of this sort is called *carrierei*.

One of the most interesting cases of juvenile forms is found among the tropical plants, which we call Aralias. For years we have grown a great many of these plants in greenhouses, producing them from seed. Because they resemble each other closely, they were all known by the one name Aralia, but when travelers visited the tropics they found that the same plants, which we have called Aralia, produced flowers of quite different structure. Inasmuch as plants are classified according to their botanical characteristics rather than superficial resemblances, some of these Aralias were given such names as Dizygotheca, Polyscias and Elaeodendron, thus designating that the three sorts differ botanically.

It is possible for us to propagate from the juvenile forms of some of these plants and have them retain their juvenile characteristics for a great many years. Everyone who grows the Moss Retinospora, *Chamaecyparis pisifera squarrosa*, is surprised to find a branch appearing upon it which resembles the Sawara Retinospora, *Chamaecyparis pisifera*, which, of course, is its mature form. It is usually advisable to remove such branches, inasmuch as the form of the tree is often ruined by this unusual foliage.

Distinguishing the Conifers

The characteristics of the commonest types of conifers are extremely distinct and easily determined. For example:

Pines always have needlelike leaves which are produced in clusters of from two, three, four or five needles, which are inclosed in a sort of sheath at the base.

Larches and the True Cedars (Cedrus) also bear their leaves in clusters, but the leaves are produced in whorls of more than five. The Larches, of course, are deciduous trees, although they are conifers. The True Cedars are evergreens.

Spruces (Picea) have needlelike leaves, which in most kinds end in a sharp point, so that the twigs are prickly to the touch. Generally, these leaves are angular in cross sections, and the cones are pendulous. The leaves arise from a cushiony ridge on the twig so that when the leaves are shed the twigs have the appearance of being corrugated.

Firs (Abies). In the Firs the leaves are usually flat and blunt tipped and are not spiny-pointed; therefore not prickly to the touch. The cones stand upright and soon after ripening fall to pieces. The leaves shed from the twigs and leave merely a little scar, but the twigs are not rough or corrugated in appearance. The buds are often covered with a thick coating of resin.

Hemlocks (Tsuga). The Hemlocks have a flat spray of foliage, which somewhat resembles Yews. But the twigs are usually yellowish or reddish-brown, and the leaves arise from tiny leaf cushions. The trees bear small, brown cones, and the leaves usually have two distinct white lines on their lower surface.

Yew (Taxus). The Yews can generally be told by the fact that the one-year old twigs are usually the same color as the leaves. In other words, they are greenish, and not brown as in Hemlocks. The fruit is a rather transparent red berry.

Douglas-fir (Pseudotsuga). Curiously enough, the Douglas-fir has been called a Spruce, a Hemlock and a Fir, inasmuch as it somewhat resembles the characteristics of all three of these conifers. The leaves are pointed, as in Spruces; flat and soft in texture, as in the Firs; and arranged in somewhat the same sort of flat sprays as a Hemlock. But the cones are unlike those of any other conifers, inasmuch as there are strange, pendulous growths, which are three-lobed, arising from between the scales. See illustration on page 398. The buds are long, slender and pointed. If one looks at a branch, he will see that as each bud arises from the twig, it disturbs the regular order of the leaves which normally pointed forward, but the bud causes the leaf at its base to point backward.

Thuja, Juniperus, Chamaecyparis. See discussion on page 32.

Success with Evergreens

"What are the reasons for the failure of evergreens?" is perhaps one of the commonest questions confronting many amateur gardeners. Let us enumerate the conditions under which evergreens thrive so that we may check over these ideal conditions and know wherein we have failed:

1. Evergreens retain their foliage throughout the Winter. Necessarily they are also giving off moisture through the Winter. In order that they may give off this moisture they must have a reserve supply of moisture in the soil. It is very necessary then, that evergreens be watered at the approach of Winter, and that if they seem at all dry, they should even be given a good soaking of water in the middle of Winter.

2. Evergreens are also sensitive to drought in the Summer. Many of our trees and perennials can become very dry so that they wilt, but when they are watered they rapidly recuperate. Evergreens, on the other hand, which wilt are slow to recover. It is therefore necessary that they be given an abundance of water in the Summer. The wise gardener will know that this does not mean that evergreens need a swampy soil. Enough is always sufficient.

3. During the Summer, evergreens should be sprayed frequently with water, as they are susceptible to red spider, a tiny mite which causes a gray appearance. Some evergreens are much more susceptible to red spider injury than others; namely, the Arborvitae, the Norway Spruce, as well as many of the Junipers. To supplement the value of spraying with water, it is wise to dust the trees with the finely ground dusting sulphur. Other plantsmen prefer to use a miscible oil. Your local nurseryman can advise you as to the proper material to use in your neighborhood.

4. Plant Foods. Many of the evergreens grow in extremely sterile locations, in mountains and upon desert-like cliffs. Nevertheless, most of the evergreens enjoy a fertile soil and some additional plant food to supplement the natural resources of the soil. For some time there has been an extensive discussion about the use of manure upon evergreens, and now it is usually conceded that well decayed cow manure when dug into the soil or used as a thin mulch is beneficial to most conifers.

In general, we may say that evergreens can be given the same plant food as the deciduous trees, but they must not be fed quite as heavily. Complete plant foods, bonemeal and even some of the fertilizers which contain an abundance of nitrogen have been used with success. It is considered advisable to mix the fertilizer with the soil at the time evergreens are transplanted. Plant foods applied to the surface of the soil are carried down to the roots gradually.

Having considered the ideal conditions for evergreen growing, it may be well to state definitely some of the reasons for failure:

1. The roots have dried before they were planted.
2. The roots have dried out in the Winter.
3. The tops have dried in Winter, due to the drying winds, and the soil, being also dry, the leaves did not get enough moisture to supply that which was lost.
4. Summer drought.
5. Red spider.
6. Too deep planting.
7. Application of excessive plant food and fresh manure.
8. Insufficient drainage.
9. In cities, dogs injure the lower branches. Small evergreens may be protected from dogs in several ways. We may use wire screen or a few shrubs, especially thorny ones like Barberries. Such shrubs, of course, may ruin the character of the lower branches by producing too much shade, but the shrubs can be kept low and so pruned that they serve as a protection for the evergreen as well as a foil for the dogs.

Courtesy Californians, Inc.

Chapter X

A FEW FAVORITE TREE POEMS

ANCIENT WARRIOR

THERE is no warrior who'll fight for life
more valiantly than a tree,
On rocky wind-swept ledge at mountain crests
or on the fiercely elemental coastline by the sea.

Roots reach out and down,
seeking a crevice
vital and rich in rain-washed sediment.
Thick trunks leaning windward,
holding out branches
patterned against the sky
like tireless models holding poses
to catch an artist's inner eye
and win companionship for a day or two.

Lonely trees understand that life is barren,
fiercely prolonged without the bird-song
of nestling mates,
without the companionship of clustered ferns and flowers,
without the whispers of wind rhythms moving through
the proud trees massed in sheltered arrayos,
until the day Man comes,
toiling two-legged to the skyline—
Man the Seeker,
Man the Sentimentalist,
To speak without saying a word,
To sit,
To contemplate, in lonely genius,
working a brush on canvas, touch for touch.
Striving from tree to Man
and Man to tree
to say,
"I understand."

—R. H. Weisbrod.
—From *Better Homes and Gardens*

WHAT DO WE PLANT?

What do we plant when we plant the tree?
We plant the ship, which will cross the sea.
We plant the mast to carry the sails;
We plant the plank to withstand the gales—
The keel, the keelson, and beam and knee;
We plant the ship when we plant the tree.

What do we plant when we plant the tree?
We plant the houses for you and me.
We plant the rafters, the shingles, the floors,
We plant the studding, the lath, the doors,
The beams and sidings, all parts that be:
We plant the house when we plant the tree.

What do we plant when we plant the tree?
A thousand things that we daily see;
We plant the spire that out-towers the crag,
We plant the staff for our country's flag,
We plant the shade, from the hot sun free;
We plant all these when we plant the tree.

—Henry Abbey.

THE HEART OF A TREE

What does he plant who plants a tree?
  He plants the friend of sun and sky;
He plants the flag of breezes free;
  The shaft of beauty, towering high;
  He plants a home to heaven anigh
    For song a mother-croon of bird
    In hushed and happy twilight heard,
The treble of heaven's harmony—
These things he plants who plants a tree.

What does he plant who plants a tree?
  He plants cool shade and tender rain,
And seed and bud of days to be,
  And years that fade and flush again;
  He plants the glory of the plain;
    He plants the forest's heritage;
    The harvest of a coming age;
  The joy that unborn eyes shall see—
These things he plants who plants a tree.

What does he plant who plants a tree?
  He plants, in sap and leaf and wood
In love of home and loyalty
  And far-cast thought of civic good—
His blessing on the neighborhood
    Who in the hollow of His hand
    Holds all the growth of all our land.
  A nation's growth from sea to sea
  Stirs in his heart who plants a tree.

—Author unknown.

THE VOICE OF A WOOD

To dwellers in a wood, almost all species of tree has its voice as well as its feature.
At the passing of the breeze, the Fir trees sob and moan no less distinctly than they rock; the Ash hisses amid its quiverings; the Beech rustles while its flat boughs rise and fall.
And Winter, which modifies the note of such trees as shed their leaves, does not destroy its individuality.

—Thomas Hardy

TREE FEELINGS

I wonder if they like it—being trees?
I suppose they do.
It must feel so good to have the ground so flat,
And feel yourself stand straight up like that.
So stiff in the middle, and then branch at ease,
Big boughs that arch, small ones that bend and blow
And all those fringy leaves that flutter so.
You'd think they'd break off at the lower end
When the wind fills them and their great boughs bend
But when you think of all the roots they drop,
As much on bottom as there is on top,
A double tree, widespread in earth and air,
Like a reflection on the water there.

—Charlotte Perkins Stetson.

THE SPIRIT OF THE TREES

When the vision flies out over the earth it would become weary if it had nothing to obstruct it; so God planted the trees out yonder that our wandering eyes may pause, like birds, and rest upon them.

—DeLong Rice.

Great trees, like great men, must live on in service after death, some to sweeten the memory with flowers and fruits that vanished with our better years, others to know more serious duties in the march of human life.

—Author unknown.

LEAVES

My great trees are stripping themselves,
Throwing away their gauds,
Preparing for the winter of their souls.

But my little cedars
Are picking up the twisted golden baubles
And sticking them in their hair.

—*Yale Review.*

'WHEN THE GREEN GITS BACK IN THE TREES"

In the Spring when the green gits back in the trees,
    And the sun comes out and stays,
And your boots pull on with a good tight squeeze,
    And you think of your barefoot days;
When you ort to work and you want to not,
    And you and yer wife agrees
It's time to spade up the garden lot—
    When the green gits back on the trees—
    Well, work is the least of my idees
    When the green, you know, gits back in the trees.

When the green gits back in the trees, and bees
    Is a-buzzin' aroun' agin,
In that kind of a lazy "go-as-you please"
    Old gait they hum roun' in;
When the ground's all bald where the hayrick stood,
    And the crick's riz, and the breeze
Coaxes the bloom in the old Dogwood,
    And the green gits back in the trees—
    I like, as I say, in sich scenes as these,
    The time when the green gits back in the trees.

When the whole tail-feathers o' winter-time
    Is all pulled out and gone,
And the sap it thaws and begins to climb,
    And the sweat it starts out on
A feller's forrerd, a-gittin' down
    At the old spring on his knees—
I kind o' like, jes a-loaferin' roun'
    When the green gits back in the trees—
    Jes' a-potterin' roun' as I—durn—please—
    When the green, you know, gits back in the trees.

—James Whitcomb Riley.

IN PRAISE OF TREES

Much can they praise the trees so straight and hy,
The sayling Pine; the Cedar proud and tall;
The vine-propp Elme; the Poplar never dry;
The builder Oake, sole king of forrests all;
The Aspine good for staves; the Cypresse funerall.

The Laurell, meed of mightie conquerors
And poets sage; the Firre that weepeth still;
The Willow, worne of forlorne Paramours;
The Eugh, obedient to the benders will;
The Birch, for shafts; the Sallow for the mill;
The Mirrhe sweete-bleeding in the bitter wound;
The warlike Beech; the Ash for nothing ill;
The fruitful Olive; and the Plantane round;
The carver Holme, the Maple seldom inward sound.

SPENSER, *Faerie Queene.*

TO A TREE

(*Written by Elias Lieberman, principal of the Thomas Jefferson High School, Brooklyn, N. Y. and by him dedicated to the school children of New York; and accepted by the School Guardian Association for use in connection with its nature work.*)

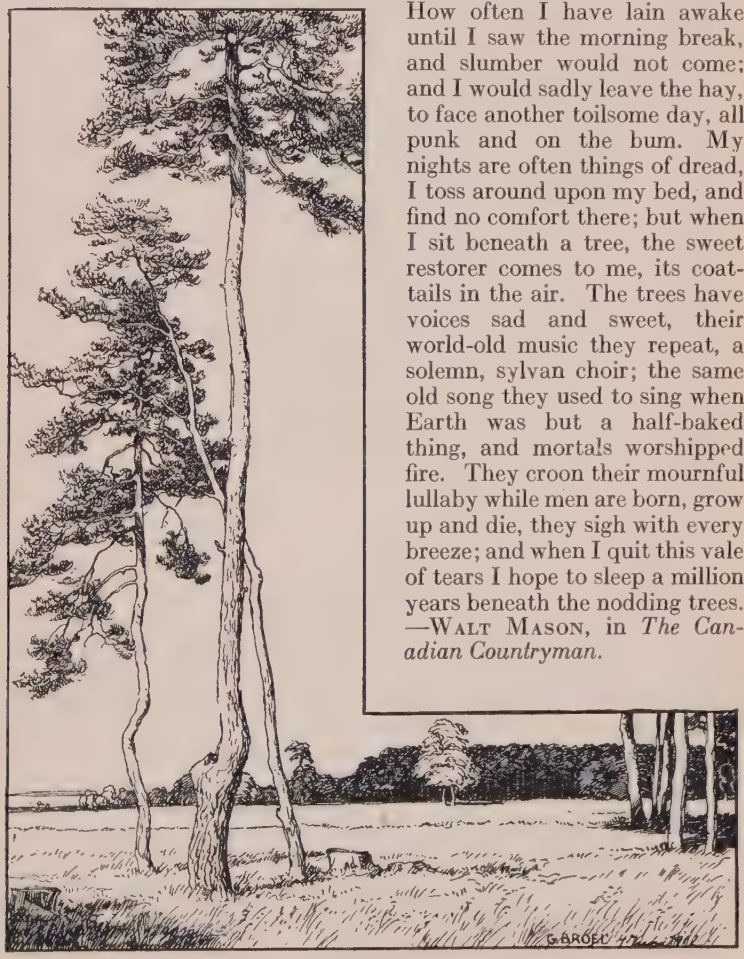
Let me stand under your great arms and feel your benediction.
I, small, unworthy, beg you in your time-girdled majesty
To teach me about eternity
For I have breathed too long the air of cities.
I have been hustled too much in crowds.
I have seen, too often, sunlight filtering through smoke.
My vision is obscured and I am puzzled. . . .

Whisper your secret, O tree, to me in the morning of my life.
Tell me of the great stores of energy drawn by you from the blue bowl of the sky.
Tell me of the miracles wrought beneath my feet.
Tell me of the gladness which is Spring, the realization which is Summer, the plenty which is Autumn and the great silent hope which is Winter.

O sheltering tree, when the wind blows through your leaves,
Whisper to me about God.

THE TREES

The trees have music of their own, a soft and soothing monotone, that lulls a man to rest. I have a volume to peruse, but, under them, I snore and snooze, my chin upon my breast. To sit beneath a swaying Birch is much like being in a church; your drowsy eyelids close and to the realms of dreams you hie, until an active, loathsome fly camps down upon your nose. How often I have lain awake until I saw the morning break, and slumber would not come; and I would sadly leave the hay, to face another toilsome day, all punk and on the bum. My nights are often things of dread, I toss around upon my bed, and find no comfort there; but when I sit beneath a tree, the sweet restorer comes to me, its coat-tails in the air. The trees have voices sad and sweet, their world-old music they repeat, a solemn, sylvan choir; the same old song they used to sing when Earth was but a half-baked thing, and mortals worshipped fire. They croon their mournful lullaby while men are born, grow up and die, they sigh with every breeze; and when I quit this vale of tears I hope to sleep a million years beneath the nodding trees.
—Walt Mason, in *The Canadian Countryman.*



TREES

I think that when we plant a tree
  And tamp its roots about with earth,
We promise it, all graciously,
That it shall ever hear our mirth;
So, planting shrub and tree and vine,
  We somehow root ourselves. It seems
Our lives and theirs must intertwine
  To form the fabric of our dreams.

That's why, when Winter winds are chill
  and I'm housed up, I like to see
The shrubs beyond the window sill
  Fling up their fingertips to me;
And when the Apple boughs bend low
  I look on them in wonderment,
Because they always seem to know
  Their partnership in my content.

A tree is more than a tree to me.
  It has a presence, and its spell
Falls on our hearts as graciously
  As tales our mothers used to tell;
And these I planted where I played
  Shall be my friends, through sun and rain
'Till I'm earthed up beneath their shade
  And dreaming girlhood's dream again.

—Jay B. Iden.

AN OLD ORCHARD

An Apple orchard is sure to bear you several crops besides the Apple. There is the crop of sweet and tender reminiscences dating from childhood, and spanning the seasons from May to October, and making the orchard a sort of outlying part of the household. You have played there as a child, mused there as a youth or lover, strolled there as a thoughtful, sad eyed man. Your father, perhaps, planted the trees, or reared them from the seed, and you yourself have pruned and grafted them, and worked among them, till every separate tree has a peculiar history and meaning in your mind. Then there is the never failing crop of birds -robins, goldfinches, king birds, cedar birds, hair birds, orioles, starlings—all nesting and breeding in its branches.

—John Burroughs. From "Winter Sunshine."

TREES

What is the wisdom taught of the trees?
Something of energy, something of ease;
Steadfastness rooted in passionless peace.

Life-giving verdure to upland and glen;
Graces—compelling the praises of men;
Freedom that bends to the eagle and wren.

Largess—expanding in ripeness and size;
Shadow that shelters the foolish and wise;
Patience that bows 'neath all winds of the skies.

Uprightness—standing for truth like a tower;
Dignity—symbol of honor and power;
Beauty that blooms in the ultimate flower!

—Stephen Henry Thayer.

WIND HARPS OF THE ROCKIES

Wind-swept Pines of the high hills are earthly harps that play supernal sonatas!

Weird minor strains scurry dolefully through gnarled branches and ring in mockery at howling coyotes.

Lilting gales sweep through a treasured Pine; the enchanting music resounds on the eardrum of inspired man.

There is a bit of melody in Pine music akin to celestial vespers. The choristers are not visible but the soul is attuned to infinity.

Wind harps of the Rockies! They interpret the symphony of the hills!

Warren E. Boyer.

Chapter XI

LISTS OF TREES FOR MANY USES

SMALL TREES

Most small home grounds are in need of small trees for lawn areas in the front and back yards. A tree which shall some day assume the proportions of an American Elm is often not the type of tree that will best suit the needs.

Boxelder, *Acer negundo*
Cornelian-cherry, *Cornus mas*
Crab, various, *Malus*
Dogwood, Flowering, *Cornus florida*
Dogwood, Pagoda, *Cornus alternifolia*
Fringetree, *Chionanthus virginica*
Goldenchain, *Laburnum anagyroides*
Goldenrain-tree, *Koelreuteria paniculata*
Holly, American, *Ilex opaca*
Hophornbeam, *Ostrya virginiana*
Hornbeam, Globe, *Carpinus betulus* var. *globosa*
Horsechestnut, Red, *Aesculus carnea*
Lilac, Japanese, *Syringa amurensis* var. *japonica*
Magnolia, see page 266
Maple, Amur, *Acer ginnala*
Maple, Hedge, *Acer campestre*
Maple, Vine, *Acer circinatum*
Mountain-ash, *Sorbus americana*
Prickly-ash, *Zanthoxylum americanum*
Redbud, *Cercis canadensis*
Russian-olive, *Elaeagnus angustifolia*
Shadblow, *Amelanchier canadensis*
Smoketree, *Rhus cotinus*
Snowbell, *Styrax japonica*
Snowdroptree, *Halesia carolina*
Sourwood, *Oxydendrum arboreum*
Spindletree, European, *Euonymus europaeus*
Sweetbay, *Magnolia glauca*
Thorn, Cockspur, *Crataegus crus-galli*
Thorn, English *Crataegus oxyacantha*
Willow, Pussy, *Salix discolor*
Willow, Goat, *Salix caprea*

FLOWERING TREES

The gardener can plant dozens of shrubs and hundreds of perennials and annuals to furnish a floral display, but his space is usually limited and he can plant only a few flowering trees. Nevertheless, it is the flowering tree which carries the display of bloom high above the garden, framing our vistas to delight the eye.

APRIL

Star Magnolia	*Magnolia stellata*	White
Red Maple	*Acer rubrum*	Red; for swamps and woodlands

The Canoe Birch is here used as a small garden tree at the home of Mark Russell, Worthington, Ohio

APRIL FLOWERING TREES—*Continued*

Cornelian-cherry	*Cornus mas*	Yellow
Saucer Magnolia	*Magnolia soulangeana*	Purple, pink and white
Japanese Cherry	*Prunus*, various	Crimson, pink and white
Sassafras	*Sassafras variifolium*	Yellow
Hornbeam	*Carpinus caroliniana*	Catkins
Shadblow	*Amelanchier canadensis*	White
MAY		
Lily Magnolia	*Magnolia purpurea*	Purple
Fraser Magnolia	*Magnolia fraseri*	White

MAY FLOWERING TREES—*Continued*

Redbud	*Cercis canadensis*	Purple
Horsechestnut	*Aesculus hippocastanum*	White
Flowering Dogwood	*Cornus florida*	White, red
European Bird Cherry	*Prunus padus*	White
Pawpaw	*Asimina triloba*	Purple maroon
Empresstree	*Paulownia tomentosa*	Lavender
Flowering Ash	*Fraxinus ornus*	Cream-white

A lane where Redbuds and Crab Apples open their dainty flowers on a Spring day and lead our wandering steps ever onward

MAY FLOWERING TREES—*Continued*

Mountain-ash	*Sorbus americana*	White
English Hawthorn	*Crataegus oxyacantha*	White, pink, red
Goldenchain	*Laburnum anagyroides*	Yellow
Fragrant Snowball	*Styrax obassia*	White
Pin Cherry	*Prunus pennsylvanica*	White
Umbrella Magnolia	*Magnolia tripetala*	White
Tuliptree	*Liriodendron tulipifera*	Yellow
Black Locust	*Robinia pseudoacacia*	White
Yellow-wood	*Cladrastis lutea*	White
Kousa Dogwood	*Cornus kousa*	White
JUNE		
Clammy Locust	*Robinia viscosa*	White
Bigleaf Magnolia	*Magnolia macrophylla*	White
Sweetbay	*Magnolia glauca*	White
Yellow-wood	*Cladrastis lutea*	White
Epaulette-tree	*Pterostyrax hispida*	White
Western Catalpa	*Catalpa speciosa*	White
Southern Magnolia	*Magnolia grandiflora*	White
American Linden	*Tilia americana*	White
JULY		
Goldenrain tree	*Koelreuteria paniculata*	Yellow
Maackia	*Maackia amurensis*	
Sourwood	*Oxydendrum arboreum*	White
Japanese Stewartia	*Stewartia pseudo-camellia*	White
Japanese Tree Lilac	*Syringa japonica*	White
AUGUST		
Chinese Scholartree	*Sophora japonica*	Cream
Java Sumac	*Rhus javanica*	White
SEPTEMBER		
Franklintree	*Franklinia alatamaha*	White

FLOWERING TREES FOR THE SOUTH

Bauhinia, *Bauhinia*
Dogwood, *Cornus florida*
Dombeya, *Dombeya wallichi*
Green-ebony, *Jacaranda ovalifolia*
Loblolly-bay, *Gordonia lasianthus*
Malabar-plum, *Eugenia jambos*
Oleander, *Nerium*
Parkinsonia, *Parkinsonia aculeata*
Poinciana, *Delonix regia*
Silkoak, *Grevillea robusta*

SPECIMEN TREES

Hardy Deciduous

Beech, American, *Fagus americana*
Birch, various, *Betula*
Cherry, various, *Prunus* (See page 303)
Crab Apple, *Malus* (See page 277)
Dogwood, Flowering, *Cornus florida*
Kousa, *C. Kousa*
Elm, American, *Ulmus americana*
Siberian, *U. parvifolia*
Goldenrain-tree, *Koelreuteria paniculata*
Hawthorn, various, *Crataegus*
Horsechestnut, *Aesculus hippocastanum*

SPECIMEN TREES—*Continued*

Hardy Deciduous (*Continued*)

Katsura-tree, *Cercidiphyllum japonica*
Linden, Silver, *Tilia tomentosa*
Magnolia, various, *Magnolia*
Maple, various, *Acer*
Oak, Pin, *Quercus palustris*
Plum, Purpleleaf, *Prunus cerasifera pissardi*
Poplar, Bolle, *Populus alba bolleana*
Lombardy, *P. nigra italica*
Sweetgum, *Liquidambar styraciflua*
Yellow-wood, *Cladrastis lutea*

Hardy Conifers

Arborvitae, various, *Thuja*
Baldcypress, *Taxodium distichum*
Cypress, various, *Chamaecyparis*
Hemlock, Carolina, *Tsuga caroliniana*
Fir, various, *Abies*
Incense-cedar, *Libocedrus decurrens*
Larch, European, *Larix europaea*
Pine, various, *Pinus*
Redcedar, various, *Juniperus virginiana*
Spruce, various, *Picea*
Umbrella-pine, *Sciadopitys verticillata*

FOR THE SOUTH

E.—Evergreens

Avocado, *Persea americana* E.
Bauhinia, Purple, *Bauhinia purpurea* E.
Bauhinia, White, *Bauhinia alba* E.
Cajeput-tree, *Melaleuca leucadendron* E.
Camphortree, *Cinnamomum camphora* E.
Cassiabark-tree, *Cinnamomum cassia* E.
Dahoon, *Ilex cassine* E.
Dombeya, Scarlet, *Dombeya wallichi* E.
Fig, Lofty, *Ficus altissima* E.
Guamachil, *Pithecollobium dulce* E.
Gum, *Eucalyptus* E.
Holly, American, *Ilex opaca* E.
Incense-cedar, *Libocedrus decurrens* E.
Loquat, *Eriobotrya japonica* E.
Mango, *Mangifera indica* E.
Norfolk-island-pine, *Araucaria excelsa* E.
Orange, Lemon, *Citrus* species
Parkinsonia, *Parkinsonia aculeata* E.
Pecan, *Hicoria pecan*
Poinciana, Royal, *Delonix regia*
Rubbertree, India, *Ficus elastica* E.
Tamarind, *Tamarindus indica* E.

PYRAMIDAL AND COLUMNAR TREES

Pyramidal trees are the exclamation points of the landscape. It is proper to use force in writing and conversation, and it is also fitting that accents be made in the backgrounds of our plantings, but they should be used with discretion. Pyramidal trees are usually given such names as columnar, fastigiate or sentry.

Many of the common trees have produced a pyramidal sport; namely, the Poplars, Maples and Elms.

They are commonly used to line the roads of France.

Birch, Pyramid European White, *Betula pendula* var. *fastigiata*. A narrow head of upright branches.
Cherry, Amanogawa, *Prunus lannesiana* var. *erecta*. Pale pink flowers.
Elm, Monument, *Ulmus foliacea* var. *monumentalis*.
Elm, Cornish, *Ulmus glabra* var. *fastigiata*. "Of little beauty," says Arnold Arboretum.

A spirelike Baldcypress, Taxodium, as it grows on upland soil. In swamps the trees become very irregular in habit and produces "knees," roots, above the water

PYRAMIDAL AND COLUMNAR TREES—*Continued*

Elm, Wheatley, *Ulmus foliacea* var. *wheatleyi*. Also called Guernsey Elm and is catalogued as *Ulmus campestre* var. *monumentalis*. Most valuable of pyramidal Elms.

Hawthorn, Pyramid English, *Crataegus monogyna* var. *stricta*.

Horsechestnut, Pyramid, *Aesculus hippocastanum* var. *pyramidalis*. Catalogued in Europe. A broad pyramid but not columnar.

Linden, Pyramidal European, *Tilia platyphyllos* var. *pyramidalis*. Broad base tapers to pointed apex.

Maple, Column Norway, *Acer platanoides* var. *columnare*. Broader than the American pyramidal Maples.

Maple, Pyramid Silver, *Acer dasycarpum* var. *pyramidale*.

Maple, Pyramid Red, *Acer rubrum* var. *columnare*. Broader than the Sentry Maple.

Maple, Sentry, *Acer saccharum* var. *monumentale*.

PYRAMIDAL AND COLUMNAR TREES—*Continued*

Oak, Pyramid English, *Quercus pedunculata* var. *fastigiata*, called Cypress Oak.
Poplar, Bolleana, *Populus bolleana*. Varies in shape, gray leaves.
Poplar, Lombardy, *Populus nigra* var. *italica*. Most popular throughout the world.
Poplar, Narrow Simon, *Populus simoni* var. *fastigiata*. With hairy leaf stalks and young shoots.
Tuliptree, Pyramid, *Liriodendron tulipifera* var. *pyramidale*.

Trees for Florida and Warmer Regions

Avocado, *Persea americana*
Bunya-bunya, *Araucaria bidwilli*
Cajeput-tree, *Melaleuca leucadendron*
Cypress-pine, *Callitris robusta*
Loblolly-bay, *Gordonia lasianthus*
Magnolia, Evergreen, *Magnolia grandiflora*
Norfolk-island-pine, *Araucaria excelsa*
Silk-oak, *Grevillea robusta*
Sweetgum, *Liquidambar styraciflua*

Conifers

Arborvitae, Pyramid American, *Thuja occidentalis* var. *pyramidalis*
Pyramid Oriental, *T. orientalis pyramidalis*
Baldcypress, *Taxodium distichum*
Cypress, Italian, *Cupressus sempervirens*. Tender
Lawson, *Chamaecyparis lawsoniana*
Sentry, *C. lawsoniana pyramidalis*
Fir, Nikko, *Abies homolepis*
White, *Abies concolor*
Juniper, Colorado, *Juniperus scopulorum*
Irish, *J. communis* var. *hibernica*
Swedish, *J. communis* var. *suecica*
Redcedar, Cannart, *Juniperus virginiana* var. *cannarti*
Column, *J. virginiana* var. *columnaris*
Schott, *J. virginiana* var. *schotti*
Silver, *J. virginiana* var. *glauca*
Spruce, various, *Picea*
Yew, Pyramid English, *Taxus baccata fastigiata*
Hicks, *T. media hicksi*

FORMAL TREES
(Round or Oval)

Beech, European, *Fagus sylvatica*
Blackhaw, *Viburnum prunifolium*
Buckeye, Red, *Aesculus carnea*
Catalpa, Umbrella (the so-called Bungei), *Catalpa bignonioides* var. *nana*
Cucumbertree, *Magnolia acuminata*
Elm, Globe, *Ulmus glabra umbraculifera*
Elm, Koopmann, *Ulmus glabra koopmanni*
Hawthorn, Paul Double, *Crataegus oxyacantha* var. *pauli*
Horsechestnut, *Aesculus hippocastanum*.
Linden, European, *Tilia europaea*
Maple, Globe Norway, *Acer platanoides globosum*
Maple, Norway, *Acer platanoides*

WEEPING TREES

There are many sorts of trees which have branches which are pendulous, some being only gently arching, others drooping listlessly.

It is not uncommon to consider that weeping trees are properly placed at the side of a pool, but Mrs. Schuyler Van Rennselaer, in her book, "Art Out-of-doors," remarks:

The very worst place for a Weeping Willow, worse than in the center of a lawn, is the very place where we most often find it—beside a placid sheet of water. The beauty of a little sheet of water is the beauty of repose, of simplicity, of breadth, of horizontal lines; with all these qualities the drooping lines of the Weeping Willow conflict. . . . I have seen one or two Japanese pictures where a Weeping Willow looked very well. There it overhung a cascade; and it looked well because the falling lines of water harmonized with its own lines.

Many of the weeping trees are really sports which are propagated by grafting upon erect stems at the heights desired. Some sorts, as for example, the Weeping Mulberry, would merely trail on the soil and become vinelike if it were not grafted. It is not uncommon for sprouts to start from below the graft; these grow upright and when not removed will deprive the weeping branches of food. Eventually this natural shoot will kill the grafted part. Take precaution to remove all shoots which start from the trunks below the grafts.

In pruning weeping trees, thin out the branches each year, cutting them back to stubs in the case of the Weeping Mulberry; otherwise the trees become full of dead branches.

In the young stages, most of the weeping trees should be staked firmly in order to get the trunk straight. The side branches then grow at will from this main stem.

Ash, Weeping European, *Fraxinus excelsior* var. *pendula*
Beech, Weeping European, *Fagus sylvatica* var. *pendula*
Weeping Purple, *Fagus sylvatica* var. *purpurea pendula*
Rivers Weeping, *Fagus sylvatica* var. *pendula riversi*
Birch, Weeping Cutleaf, *Betula alba* var. *laciniata*
Youngs Weeping, *Betula alba* var. *youngi*
Cherry, Japanese Flowering, *Prunus serrulata*
Higan, *Prunus subhirtella* var. *pendula*
Dogwood, Weeping Flowering, *Cornus florida* var. *pendula*
Elm, Camperdown, *Ulmus glabra* var. *pendula*
Larch, Weeping, *Larix europaea* var. *pendula*
Linden, Weeping American, *Tilia americana* var. *pendula*
Maple, Wier, *Acer dasycarpum* var. *wieri*
Mountain-ash, Weeping, *Sorbus aucuparia* var. *pendula*
Mulberry, Teas Weeping, *Morus alba* var. *pendula*
Scholartree, Weeping, *Sophora japonica* var. *pendula*

WEEPING TREES—*Continued*

Willow, Babylon Weeping, *Salix babylonica*
Kilmarnock Weeping, *Salix caprea* var. *pendula*
Niobe Weeping (*Salix alba* x *S. fragilis*)
Salamon Weeping, *Salix salamoni*
Thurlow Weeping, *Salix elegantissima*
Weeping Golden; *Salix vitellina* var. *pendula*, golden yellow branches.
Wisconsin Weeping, *Salix blanda*

CONIFERS

Weeping Baldcypress, *Taxodium distichum pendula*
Weeping Hemlock, *Tsuga canadensis pendula*
Weeping Hinoki Cypress, *Chamaecyparis obtusa pendula*
Weeping Lawson Cypress, *C. lawsoniana pendula*
Weeping Norway Spruce, *Picea excelsa pendula*
Weeping Koster Blue Spruce, *P. pungens kosteri* var. *pendula*

RAPID GROWING TREES

FOR THE NORTH

Boxelder, *Acer negundo*
Catalpa, Western, *Catalpa speciosa*
Cherry, Wild Black, *Prunus serotina*
Corktree, *Phellodendron amurense*
Elm, Chinese, *Ulmus parvifolia*
Locust, Black, *Robinia pseudoacacia*
Maple, Silver, *Acer dasycarpum*
Mulberry, White, *Morus alba*
Osage-orange, *Maclura pomifera*
Planetree, London, *Plantanus acerifolia*
Poplar, Various, *Populus*
Tree-of-heaven, *Ailanthus glandulosa*
Willows, Various, *Salix*

CONIFERS

Larch, European, *Larix europaea*
Pine, Scotch, *Pinus sylvestris*
Spruce, Norway, *Picea excelsa*
Servian, *P. omorika*

FOR THE SOUTH

Beefwood, *Casuarina*
Cajeput-tree, *Melaleuca*
Fig, *Ficus*
Green-ebony, *Jacaranda*
Gum, *Eucalyptus*
Oak, Laurel, *Quercus laurifola*
Poinciana, Royal, *Delonix regia*
Silkoak, *Grevillea robusta*

TREES FOR HEDGES

Beech, European	*Fagus sylvatica*	Hardy
Beefwood	*Casuarina cunninghamiana*	Tender
Brush-cherry, Australian	*Eugenia myrtifolia*	Tender
Camphortree	*Cinnamomum camphora*	Tender
Eugenia, Hooker	*Eugenia hookeriana*	Tender
Hawthorn, Various	*Crataegus oxyacantha, C. crus-galli* and others	Hardy
Honeylocust	*Gleditsia triacanthos*	Hardy
Hornbeam, European	*Carpinus betulus*	Hardy
Laurelcherry	*Laurocerasus caroliniana*	Tender
Oleander	*Nerium oleander*	Tender
Osage-orange	*Maclura pomifera*	Hardy
Roseapple	*Eugenia jambos*	Tender
Thorn, Black	*Prunus spinosa*	Hardy
Waxmyrtle, Southern	*Myrica cerifera*	Tender

TREES FOR HEDGES—*Continued*

Evergreens

Arborvitae, American Pyramid	*Thuja occidentalis pyramidalis*
Hemlock	*Tsuga canadensis*
Spruce, Norway	*Picea excelsa*
Yew, Japanese	*Taxus cuspidata*

SOUTHERN TREES FOR POOR SOIL

Bauhinia, *Bauhinia*
Beefwood, *Casuarina*
Cajeput-tree, *Melaleuca leucadendron*
Fig, *Ficus*
Green-ebony, *Jacaranda ovalifolia*
Gum, *Eucalyptus*
Oleander, *Nerium oleander*
Parkinsonia, *Parkinsonia aculeata*
Silk-oak, *Grevillea robusta*

TREES THAT TOLERATE SMOKE

(See Civilized Trees, page 95)

Deciduous Trees
Ash, *Fraxinus*
Birch, *Betula*
Dogwood, *Cornus*
Hawthorn, *Crataegus*
Holly, *Ilex*
Hornbeam, *Carpinus*
Horsechestnut, *Aesculus*
Planetree, *Platanus*
Poplar, *Populus*
Shadblow, *Amelanchier*
Tree-of-heaven, *Ailanthus*
Tuliptree, *Liriodendron*
Willow, *Salix*
Conifers
Pine, Austrian, *Pinus nigra austriaca*
Mountain, *P. montana*
Scotch, *P. sylvestris*
Spruce, Colorado, *Picea pungens*

TREES FOR THE SEASIDE

Aspen, Quaking	*Populus tremuloides*	Hardy
Birch, Paper	*Betula papyrifera*	Hardy
Cajeput-tree	*Melaleuca leucadendron*	Tender
Cherry, Wild Black	*Prunus serotina*	Hardy
Hawthorn, English	*Crataegus oxyacantha*	Hardy
Honeylocust	*Gleditsia triacanthos*	Hardy
Horsetail-tree	*Casuarina equisetifolia*	Tender
Loquat	*Eriobotrya japonica*	Tender
Maple, Red	*Acer rubra*	Hardy
Oak, Laurel	*Quercus laurifolia*	Tender
Live	*Q. virginiana*	Tender
Red	*Q. rubra*	Hardy
Oleander	*Nerium oleander*	Tender
Planetree	*Platanus occidentalis*	Hardy
Plum, Beach	*Prunus maritima*	Hardy

The short, stout branches of the Pitch Pine are very picturesque, especially when they are loaded with their globular cones

TREES FOR THE SEASIDE—*Continued*

Poplar, Carolina	*Populus eugenei*	Hardy
White	*P. alba*	Hardy
Russian-olive	*Elaeagnus angustifolia*	Hardy
Sassafras	*Sassafras variifolia*	Hardy
Sea-buckthorn	*Hippophae rhamnoides*	Hardy
Seagrape	*Coccoloba uvifera*	Tender

TREES FOR SANDY SOIL

Acacia	*Acacia*	Tender
Carob	*Ceratonia siliqua*	Tender
Cherry, Harbinger	*Prunus padus commutata*	
Cornelian-cherry	*Cornus mas*	

TREES FOR SANDY SOIL—*Continued*

Crab, Siberian	*Malus baccata*	
Cypress, Arizona	*Cupressus arizonica*	
Deodar	*Cedrus deodara*	
Dogwood, Flowering	*Cornus florida*	
Gum, Desert	*Eucalyptus rudis*	Tender
Locust. Black	*Robinia pseudoacacia*	
Oak, Red	*Quercus rubra*	
Peppertree	*Schinus molle*	Tender
Pine, Jack	*Pinus banksiana*	
Scotch	*P. sylvestris*	
Western Yellow	*P. ponderosa*	
White	*P. strobus*	
Plum, Beach	*Prunus maritima*	
Redcedar	*Juniperus virginiana*	
Silk-oak	*Grevillea robusta*	Tender
Whitecedar	*Chamaecyparis thyoides*	

TREES FOR ADOBE SOILS

Acacia, various	*Acacia*	Tender
Birch, various	*Betula*	Hardy
Gum, various	*Eucalyptus*	Tender
Lyontree	*Lyonothamnus floribundus*	Tender
Oak, California Live	*Quercus agrifolia*	Tender
Valley	*Q. lobata*	Tender
Pine, Monterey	*Pinus radiata*	Tender
Planetree, Oriental	*Platanus orientalis*	Hardy
Tree-of-heaven	*Ailanthus glandulosa*	Hardy
Tupelo	*Nyssa sylvatica*	Hardy
Waxmyrtle, Southern	*Myrica cerifera*	Tender
Willow, Goat	*Salix caprea*	Hardy
Shining	*S. lucida*	Hardy
White	*S. alba*	Hardy
	CONIFERS	
Larch, American	*Larix laricina*	Hardy
Pine, Japanese	*Pinus banksiana*	Hardy
Pitch	*P. rigida*	Hardy
Red	*P. resinosa*	Hardy
Redcedar	*Juniperus virginiana*	Hardy
Spruce, Blue	*Picea pungens*	Hardy
Red	*P. rubra*	Hardy
White	*P. canadensis*	Hardy

TREES FOR ALKALI SOILS

The following trees may be grown in soil which is strongly alkaline:

Albizzia, Plume	*Albizzia lophantha*	Tender
Ash, Arizona	*Fraxinus velutina*	Tender
Beefwood	*Casuarina cunninghamiana*	Tender

TREES FOR ALKALI SOILS—*Continued*

Camphor*	*Cinnamomum camphora*	Tender
Canary Date Palm	*Phoenix canariensis*	Tender
Crapemyrtle	*Lagerstroemia indica*	Tender
Elm*	*Ulmus*	
Goldenrain-tree†	*Koelreuteria paniculata*	Hardy
Gum, Peppermint	*Eucalyptus amygdalina* nad variety *angustifolia*	Tender
Honeylocust*	*Gleditsia triacanthos*	Hardy
Horsetail-tree	*Casuarina equisetifolia*	Tender
Palms	*Phoenix* and *Washingtonia*	Tender
Planetree, London	*Platanus acerifolia*	Hardy
Locust, Black	*Robinia pseudoacacia*	Hardy
Maple, Oregon*	*Acer macrophyllum*	Hardy
Peach, Chinese Wild**	*Amygdalus davidiana*	Tender
Poplar, Fremont	*Populus fremonti*	Tender
Russian-olive	*Elaeagnus angustifolia*	Hardy
Tree-of-heaven	*Ailanthus glandulosa*	Hardy

TREES FOR WET SOIL

Alder, various, *Alnus*
Arborvitae, American, *Thuja occidentalis*
Ash, Black, *Fraxinus nigra*
Red, *F. pennsylvanica*
Aspen, *Populus tremuloides*
Baldcypress, *Taxodium distichum*
Birch, River, *Betula nigra*
Elm, American, *Ulmus americana*
Fir, Balsam, *Abies balsamea*
Hickory, Shellbark, *Hicoria laciniosa*
Hornbeam, American, *Carpinus caroliniana*
Larch, American, *Larix laricina*
Linden, American, *Tilia americana*
Loblolly-bay, *Gordonia lasianthus* Tender
Maple, Red, *Acer rubrum*
Soft, *A. dasycarpum*
Oak, Black, *Quercus velutina*
Pin, *Q. palustris*
Red, *Q. rubra*
Swamp, White, *Q. bicolor*
Poplar, various, *Populus*
Spruce, Black, *Picea mariana*
Sweet Gum, *Liquidambar styraciflua*
Tupelo, *Nyssa sylvatica*
Whitecedar, *Chamaecyparis thyoides*
Willow, various, *Salix*

TREES WITH ORNAMENTAL FRUIT

Cherry, Bird	*Prunus pennsylvanica*	Black
Corktree	*Phellodendron amurense*	Black
Cornelian-cherry	*Cornus mas*	Red
Crab, various	*Malus*	Red, yellow
Dahoon	*Ilex vomitoria*	Red
Dogwood, Flowering	*Cornus florida*	Scarlet
Holly	*Ilex opaca*	Red
Maple, Red	*Acer rubrum*	Bright red

* Slightly tolerant.
† The most alkali-tolerant tree according to R. H Loughridge of Berkeley, California.
** A stock upon which the various Prunus can be budded to adapt them.

TREES WITH ORNAMENTAL FRUIT—*Continued*

Mountain-ash	*Sorbus americana*	Red
Sassafras	*Sassafras variifolia*	Blue
Sea-buckthorn	*Hippophae rhamnoides*	Yellow
Smoketree	*Rhus cotinoides*	Purple, green
Spindletree	*Euonymus*, various	Red, purple
Sumac, Staghorn	*Rhus typhina*	Red
Thorn, various	*Crataegus* various, especially *C. cordata*, the Washington T., which holds fruits until late Winter	Red
Yaupon	*Ilex cassine*	Red

LEAVES CHANGE COLOR IN AUTUMN

Yellow

Ash, American, *Fraxinus americana*
Boxelder, *Acer negundo*
Birch, Yellow, *Betula lutea*
Coffeetree, *Gymnocladus*
Ginkgo, *Ginkgo*
Honeylocust, *Gleditsia*
Katsura-tree, *Cercidiphyllum*
Tuliptree, *Liriodendron*
Yellow-wood, *Cladrastis*

Orange

Hawthorn, *Crataegus*
Hornbeam, *Carpinus*

Purple

Ash, American, *Fraxinus americana*
Oak, White, *Quercus alba*

Red

Dogwood, Flowering, *Cornus florida*
Euptelea
Hawthron, *Crataegus*
Hornbeam, *Carpinus*
Maple, Red, *Acer rubrum*
  Sugar, *A. saccharum*
Oak, Black, *Quercus velutina*
  Pin, *Q. palustris*
  Red, *Q. rubra*
  Scarlet, *Q. coccinea*
Sassafras, *Sassafras*
Shadblow, *Amelanchier*
Sourwood, *Oxydendrum*
Spindletree, European, *Euonymus europaea*
Sumac, *Rhus*
Sweetgum, *Liquidambar*
Tupelo, *Nyssa*

TREES WITH YELLOW FOLIAGE

Alder, Golden Speckled. *Alnus incana aurea.* Young leaves and twigs yellow. Catkins flesh pink. Slow growth. Rather tender. Beautiful in Spring.

Ash, Golden European. *Fraxinus excelsior aurea.* Branches and young leaves yellow. Attractive in Spring.

Cornelian-cherry, Golden. *Cornus mas aurea.* Bright yellow in Spring. Rather fastidious and tender and of no importance in warm regions, according to the Morton Arboretum.

Cottonwood, Golden. *Populus canadensis aurea.* Yellow only in Spring.

Elm, Golden Scotch. *Ulmus glabra lutescens.*

Elm, Golden English. *Ulmus campestris procera.*

Linden, Goldentwig. *Tilia platyphyllos aurea.* Soft yellow, young leaves.

Maple, Golden Coliseum. *Acer cappadocicum aureum* (*laetum aureum*). Golden with bronze tint. Rather tender.

TREES WITH YELLOW FOLIAGE—*Continued*

Maple, Golden Sugar. *Acer saccharum lutescens.* Yellow when young, green later.

Maple, Yellow Sycamore. *Acer pseudoplatanus worleei.* Deep yellow becomes greenish later in season. Petioles reddish.

Mountain-ash, Golden. *Sorbus aucuparia lutea.* Bright yellow in Spring, green later.

Oak, Golden English. *Quercus robur concordia.* Leaves bright yellow.

TREES WITH RED OR PURPLE FOLIAGE

Beech, Purple. *Fagus sylvatica purpurea.*

Weeping Purple. *Fagus sylvatica purpurea pendula.* Both of these varieties are difficult to establish.

Birch, Purpleleaf White. *Betula alba pendula purpurea.*

Catalpa, Purpleleaf. *Catalpa hybrida purpurea.*

Crab, Purpleleaf. *Malus purpurea aldenhamensis.* The Morton Arboretum considers this the best of the red leaf Crabs.

Crab, Eley. *Malus eleyi.* More treelike than the above.

Crab, Redvein. *Malus niedzwetzkyana.*

Filbert, Purple Giant. *Corylus maxima purpurea.*

Maple, Bloodleaf Japanese. *Acer palmatum atropurpureum.*

Maple, Bloodleaf Norway. *Acer platanoides rubrum (reitenbachi).* Young leaves greenish purple, older ones dark red.

Maple, Cutleaf Blood Japanese. *Acer palmatum atropurpureum ornatum.*

Maple, Purple Hedge. *Acer campestre schwerini.* Brownish-purple in Spring.

Maple, Purple Sycamore. *Acer pseudoplatanus purpurascens.* Underside of leaves bright purple. Young plants when first transplanted may not show the bright color.

Maple, Red Coliseum. *Acer cappacocicum rubrum.* Young leaves and shoots blood red, green later. Somewhat tender.

Maple, Schwedler. *Acer platanoides schwedleri.* Red unfolding leaves, green later.

Oak, Purple, English. *Quercus robur purpurascens.* Dark purple.

Plum, Purpleleaf. *Prunus cerasifera pissardi* and *spaethiana.* Remain red all Summer.

TREES WITH VARIEGATED FOLIAGE

Ash, Aucuba-leaf Red. *Fraxinus pennsylvanica aucubaefolia.* Mottled.

Ash, Variegated European. *Fraxinus excelsior argenteo-variegata.* White variegations.

Beech, Tricolor. *Fagus sylvatica tricolor.* Leaves green, white and pink variegated.

Boxelder. *Acer negundo variegata.* White variegated.

Maple, Leopold. *Acer pseudoplatanus leopoldi.* White and pink variegations.

Maple, Variegated Norway. *Acer platanoides variegata.* Pink and white variegations.

All these trees enjoy the cooler climates and at the same time are not exceedingly hardy. In the hot suns of the Middle West they burn badly.

BROADLEAF EVERGREENS

Most of the broadleaf evergreen trees are confined to regions south of Washington.

Avocado, *Persea americana*

Camellia, *Camellia japonica*

Camphortree, *Cinnamomum camphora*

Dahoon, *Ilex cassine*

Holly, *Ilex opaca*

Laurelcherry, *Laurocerasus caroliniana*

Loblolly-bay, *Gordonia lasianthus*

Loquat, *Eriobotrya japonica*

Magnolia, Evergreen, *Magnolia grandiflora*

Redbay, *Persea borbonia*

Sweetbay, *Magnolia glauca*. Hardy

CONIFEROUS EVERGREENS FOR LAWN PLANTING

Arborvitae, American, *Thuja occidentalis*
- Siberian, *T. occidentalis wareana*

Baldcypress, *Taxodium distichum*

Cypress, Lawson, *Chamaecyparis lawsoniana*

Douglas-fir, *Pseudotsuga douglasi*

Fir, Alpine, *Abies lasiocarpa*
- Cilician, *A. cilicica*
- Nikko, *A. homolepis*
- Nordmann, *A. nordmanniana*
- Veitch, *A. veitchi*
- White, *A. concolor*

Hemlock, Canada, *Tsuga canadensis*
- Carolina, *T. caroliniana*
- Japanese, *T. diversifolia*

Pine, Austrian, *Pinus nigra*
- Limber, *P. flexilis*
- Mountain, *P. montana*
- Norway or Red, *P. resinosa*
- Pitch, *P. rigida*
- Scotch, *P. sylvestris*

Pine
- Swiss Stone, *P. cembra*
- Western Yellow, *P. ponderosa*
- White, *P. strobus*

Redcedar, *Juniperus virginiana*
- Cannart, *J. virginiana cannarti*
- Silver, *J. virginiana glauca*

Retinospora, Goldenplume, *Chamaecyparis pisifera plumosa aurea*
- Golden Sawara, *C. pisifera aurea*
- Moss, *C. pisifera squarrosa*
- Plume, *C. pisifera plumosa*
- Sawara, *C. pisifera*

Spruce, Alcock, *Picea alcockiana*
- Colorado, *P. pungens*
- Koster Blue, *P. pungens kosteri*
- Norway, *P. excelsa*
- Oriental, *P. orientalis*
- Serbian, *P. omorika*
- Tigertail, *P. polita*
- White, *P. canadensis*

Yew, Japanese, *Taxus cuspidata*

It is trite to say that much of the beauty of any country is due to the trees which clothe its mountain slopes and river valleys or line the roadsides and hedgerows. In the Summertime, when clothed with leafage, all deciduous trees to a casual observer look very much alike. In the Autumn, when change of color in the leaves takes place, variety becomes apparent, but it is in the Winter when the trees are naked that they best display their individualities.—Ernest H. Wilson.

The Moss Retinospora, Chamaecyparis pisifera squarrosa, is here used for a foundation planting

CONIFEROUS EVERGREENS FOR FOUNDATION PLANTING

TALL SORTS FOR CORNER OF HOUSES AND BACKGROUNDS

Arborvitae, American Pyramid, *Thuja occidentalis pyramidalis*
George Peabody, *T. occidentalis*
Oriental Pyramid, *T. orientalis* (*Biota*)
Cypress, Hinoki, *Chamaecyparis obtusa*
Lawson, *C. lawsoniana*
Hemlock, Canada, *Tsuga canadensis*
Carolina, *T. caroliniana*
Juniper, Swedish, *Juniperus communis suecica*
Pine, Swiss Mountain, *Pinus montana*
Redcedar, *Juniperus virginiana*
Cannart, *J. virginiana cannarti*
Schott, *J. virginiana schotti*
Silver, *J. virginiana glauca*
Retinospora, Goldenplume, *Chamaecyparis pisifera plumosa aurea*
Golden Sawara, *C. pisifera aurea*
Moss, *C. pisifera squarrosa*
Plume, *C. pisifera plumosa*
Sawara, *C. pisifera*
Thread, *C. pisifera filifera*
Yew, Japanese, *Taxus cuspidata*

EVERGREENS FOR THE SHADE

Box, Tree, *Buxus sempervirens arborescens*
Hemlock, Canada, *Tsuga canadensis*
Holly, American, *Ilex opaca*
Pine, Mountain, *Pinus montana*
Yew, Canada, *Taxus canadensis*
Japanese, *T. cuspidata*

TREES FOR THE COLD NORTH*

BEST SMALL LAWN TREE

Amur Maple, *Acer ginnala.*
Tatarian Maple, *Acer tatarica*

BEST SMALL TREE WITH WHITE FLOWERS IN EARLY SPRING

Downy Shadblow, *Amelanchier canadensis.*

DESIRABLE SMALL ROUND TREE

Hawthorn, Thicket, *Crataegus coccinea.*

DESIRABLE SMALL TREE WITH SILVERY LEAVES

Russian-olive, *Elaeagnus angustifolia.*

DESIRABLE LAWN TREES WITH WHITE AND PINK FLOWERS

Crab, Amur. Small fruit the size of a Cherry and a variety of the Siberian Crab.

Beauty. Seedling raised by Dr. Hansen from Russia. The fruits are small and brilliant red, keep well and may be used for apple sauce.

Cathay or Rinki. Dwarf tree which when in bloom is a bouquet of bloom.

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* List derived from *The Ornamental Trees of South Dakota* by Dr. N. E. Hansen, famed experimenter with plants for the cold North.

You have seen spots just like this one. Unfortunately, you have also come upon similar spots without trees. How charmingly our interest in the distant view is heightened by the white trunks of these Birches

TREES FOR THE COLD NORTH—*Continued*

Dolgo. Early; a seedling of the Siberian Crab.

Hopa. Large purple-red flowers and bright red fruits. Hopa is the Sioux word for "beautiful," which is a true description.

Redflesh. The flesh of the apples is bright red, which makes it doubly desirable for preserves as well as ornament.

Redtip. The leaves have red tips which are extremely ornamental. The fruit is not of value for table use.

Siberian, *Malus baccata*. (See page 282.)

Western. *M. ioensis*.

Poplar, Bolleana, *Poplar alba var. bolleana*

OTHER LAWN TREES OF PERFECT HARDINESS

Aspen, Quaking, *Populus tremuloides*
Catalpa, Western, *Catalpa speciosa*
Cherry, Harbinger, *Prunus padus commutata*
Coffeetree, Kentucky, *Gymnocladus*
Elm, American, *Ulmus americana*
Chinese, *U. parvifolia*
Rock, *U. racemosa*
Hackberry, *Celtis occidentalis*
Honeylocust, *Geditsia triacanthos*
Linden, American, *Tilia americana*
Mountain-ash, European, *Sorbus aucuparia* (Shade stem to prevent sun scald)
Oak, Mossycup, *Quercus macrocarpa*
Pear, Ussurian or Harbin, *Pyrus ussuriensis*
Walnut, Royal, *Juglans nigra*
Willow, Laurel, *Salix pentandra*
Niobe Weeping, *S. alba* × *S. fragilis*
Royal, *S. regalis*

"Every pine and fir and hemlock
Wore ermine too dear for an earl,
And the poorest twig on the elm-tree
Was ridge inch deep with pearl."
—James Russell Lowell

TREES FOR SOUTHEASTERN UNITED STATES*

Birch, Black, *Betula nigra*
Elm, Winged, *Ulmus alata*
Hickory, Mockernut, *Hicoria alba*
Holly, American, *Ilex opaca*
Magnolia, Evergreen
Magnolia grandiflora
Mango
Mangifera indica
Oak, Laurel
Quercus laurifolia
Live
Quercus virginiana
Overcup
Quercus lyrata
Post
Quercus stellata
Southern Red
Quercus rubra
Swamp Chestnut
Quercus michauxi
Water
Quercus nigra
Willow
Quercus phellos
Pecan
Hicoria pecan
Persimmon
Diospyros virginiana
Tupelo
Nyssa sylvatica

A cluster of Mangoes

* From *Forestry Almanac.*

TREES FOR OREGON AND WASHINGTON

DECIDUOUS

Ash, White, *Fraxinus americana*
Elm, American, *Ulmus americana*
English, *U. campestris*
Honeylocust, *Gleditsia triacanthos*
Horsechestnut, Red, *Aesculus carnea*
Linden, Common, *Tilia vulgaris*
Locust, Black, *Robinia pseudoacacia*
Madrone, *Arbutus menziesi*
Maple, Norway, *Acer platanoides*
Oregon, *A. macrophylla*
Sycamore, *A. pseudoplatanus*
Vine, *A. circinatum*
Oak, Scarlet, *Quercus coccinea*
Planetree, California, *Platanus californica*
London, *P. acerifolia*
Walnut, California Black, *Juglans californica*

CONIFERS

Cedar, Atlas, *Cedrus atlantica*
Cedar of Lebanon, *C. libani*
Cypress, Hinoki, *Chamaecyparis obtusa*
Lawson, *C. lawsoniana*
Moss, *C. pisifera squarrosa*
Nootka, *C. nootkatensis*
Plume, *C. pisifera plumosa*
Sawara, *C. pisifera*
Deodar, *Cedrus deodara*
Douglas-fir, *Pseudotsuga douglasi*
Fir, Great Silver, *Abies grandis*
Red, *A. nobilis*
White, *A. concolor*
Hemlock, Western, *Tsuga heterophylla*
Juniper, Chinese, *Juniperus chinensis*

TREES FOR OREGON AND WASHINGTON—*Continued*

Juniper
  Colorado, *J. scopulorum*
Pine, Austrian, *Pinus nigra austriaca*
  Bull, *P. ponderosa*
  Knobcone, *P. attenuata*
  Monterey, *P. radiata*
  Scotch, *P. sylvestris*
Pine, Shore, *P. contorta*
  White, *P. strobus*
Redcedar, *Juniperus virginiana*
Spruce, Engelmann, *Picea engelmanni*
  Sitka, *P. sitchensis*
Yew, English, *Taxus baccata*

TREES FOR CALIFORNIA

Deciduous Trees

Cottonwood, Fremont, *Populus fremonti*
Dogwood, Pacific, *Cornus nuttalli*
Elm, Dwarf Asiatic, *Ulmus pumila*
Empresstree, *Paulownia imperialis*
Goldenrain-tree, *Koelreuteria paniculata*
Pistachia, *Pistachia chinensis*
Redbud, *Cercis siliquastrum*
Sweetgum, *Liquidambar styraciflua*

The Pacific Dogwood, Cornus nuttalli, has large white flowers opening after the leaves are well expanded. It can be grown only in the less severe climates.

TREES FOR CALIFORNIA—*Continued*

Broadleaf Evergreens

Acacia, Silver Wattle, *Acacia dealbata*
Black Wattle, *A. mollissima*
Weeping Myal, *A. pendula*
Carob, *Ceratonia siliqua*
Elm, Evergreen Chinese, *Ulmus parvifolia*
Eucalyptus, Flame, *Eucalyptus ficifolia*
Manna Gum, *Eucalyptus viminalis*
Hymenosporum, *Hymenosporum flavum*
Jacaranda, *Jacaranda acutifolia*
Jerusalem-thorn, *Parkinsonia aculeata*
Lagunaria, *Lagunaria pattersoni*
Queensland-nut, *Macadamia ternifolia*
Peppertree, *Schinus molle*
Pinkball, *Dombeya wallichi*
Pittosporum, Queensland, *Pittosporum rhombifolium*

Conifers

California-nutmeg, *Torreya californica*
Cedar, Mt. Atlas, *Cedrus atlantica*
Cypress, Italian, *Cupressus sempervirens* var. *stricta*
Cypress, Lawson, *Chamaecyparis lawsoniana*
Cypress, Monterey, *Cupressus macrocarpa*
Deodar, *Cedrus deodara*
Norfolk-island-pine, *Araucaria excelsa*
Pine, Canary, *Pinus canariensis*
Podocarpus, *Podocarpus macrophylla*

TREES FOR FLORIDA

Flowering Trees

Baobab-tree, *Adansonia digitata*
Bombax, *Bombax malabaricum*
Dogwood, Flowering, *Cornus florida*
Empresstree, *Paulownia tomentosa*
Goldenrain-tree, Formosa, *Koelreuteria formosana*
Jacaranda, *Jacaranda acutifolia*
Jerusalem-thorn, *Parkinsonia aculeata*
Magnolia, Southern, *Magnolia grandiflora*
Mountain-ebony, *Bauhinia purpurea*
Pinkball, *Dombeya wallichi*
Poinciana, Royal, *Delonix regia*
Silktree, *Albizzia julibrissin*
Tuliptree, *Liriodendron tulipifera*

Trees with Unusual Fruits

Anatto-tree, *Bixa orellana*.....Spiny, chestnutlike fruits
Calabashtree, *Crescentia cujete* and *alata*.....Large, Gourdlike fruits
Holly, American, *Ilex opaca*.....Showy red fruits
Holly, Yaupon, *Ilex vomitoria*.....Very abundant red fruits which split to reveal small, round seeds
India-almond, *Terminalis catappa*.....Edible small fruits
Parasoltree, Chinese, *Sterculia platanifolia*.....Showy pods
Peppertree, Brazilian, *Schinus terebinthefolius*...Large clusters of red fruits
Redbead, *Adenanthera pavonina*.....Brilliant red seeds
Sandboxtree, *Hura crepitans*.....Large pods sometimes used as sand sifters before advent of blotters
Sausagetree, *Kigelia pinnata*.....Long, sausage-like fruits hanging from long stems

Chapter XII

A TREE CALENDAR

JANUARY

1. Transplant large trees with a frozen ball of earth around the roots.
2. Cut out branches of Willow and Poplar which are infested with borers.

FEBRUARY

1. Prune all trees.
2. Order nursery stock.
3. Spray trees for scale.
4. Prune off dead twigs of Planetree and Oak which have died due to anthracnose.

MARCH

1. Plant trees. (See diagram, page 98.)
2. Provide drainage for trees before setting.
3. Collect egg masses of the white-marked tussock moth.

APRIL

1. Feed the trees with a complete well balanced fertilizer.
2. Transplant such suckers as grow at the base of some trees.
3. Sow seeds of trees collected in late Summer and Fall.

MAY

1. Destroy the tent caterpillar by burning.
2. Bagworm eggs hatch.
3. Spray for browntail moth, cankerworms and elmleaf beetle with arsenate of lead.

JUNE

1. Spray for plant lice.
2. Sow seeds of such Maples and Elms as are ripe.
3. Gather seeds of Birches, Poplars, Maples.
4. Pick the bagworms from the tree.

JULY

1. Feed trees.
2. Water thoroughly if weather becomes dry.
3. Pick off bagworms.
4. Sow all seeds which mature before this date.

AUGUST

1. Continue to water.
2. Spray for leaf eating and sucking insects.

SEPTEMBER

1. Stake young trees so that they are not injured by Winter winds.
2. Look for borers in Sugar Maple and remove.

OCTOBER

1. Gather nuts to eat and to plant.
2. Destroy egg masses of gypsy moth and others.
3. Examine trunks of Maples, Poplars, Locusts, and Elms for borers. Remove with wire or pocket knife.

Chapter XIII

RAPIDITY OF GROWTH

	14 Years*		22 Years‡		20 Years
	Height in feet	Girth in inches	Height in feet	Girth in inches	Girth in inches
Acer dasycarpum. Silver Maple	50	81	47	46	63†
negundo. Boxelder	..	..	47	46	..
rubrum. Red M.	30	30	33	27	48†
saccharum. Sugar M.	25	24	33	27	39†
Aesculus hippocastanum. Horsechestnut	..	..	28m	53m	39†
Ailanthus glandulosa. Tree-of-heaven	..	..	45m	48m	48†
Betula alba. European White Birch	35	43	40	38	..
nigra. River Birch	35	62	..	..	..
Castanea americana. Chestnut	..	..	50m	90m	32†
Catalpa speciosa. Western Catalpa	30	48	50m	57m	38†
Celtis occidentalis. Hackberry	..	..	..	..	30†
Fagus americana. American Beech	..	..	35m	54m	..
Fraxinus americana. American Ash	29	39	33	27	36†
quandrangulata. Blue A.	..	..	..	..	50m
Gleditsia triacanthos. Honeylocust	..	..	..	..	39†
Gymnocladus dioica. Kentucky Coffeetree	..	..	..	..	52m
Hicoria ovata. Shagbark Hickory	..	..	..	..	48m
Juglans nigra. Black Walnut	..	..	23	23	..
Larix laricina. American Larch	..	..	35	33	..
Liquidambar styraciflua. Sweetgum	..	..	..	..	53m
Liriodendron tulipifera. Tuliptree	35	38	45m	72m	54†
Morus alba. White Mulberry	20	56	..	..	..
Picea canadensis. White Spruce	..	..	27	40	..
excelsa. Norway S.	..	..	40	47	..
Pinus nigra austriaca. Austrian Pine	..	..	32	44	..
strobus. White P.	..	..	34	46	..
sylvestris. Scotch P.	..	..	35	47	..
Platanus occidentalis. American Planetree	..	..	33	27	54†
Populus balsamifera. Cottonwood	60	96	..	..	93m
nigra italica. Lombardy Poplar	65	78	..	..	..
Prunus serotina. Wild Black Cherry	..	..	45m	89m	..
Quercus macrocarpa. Mossycup Oak	26	20	45m	74m	..
palustris. Pin O.	..	..	..	..	39†
phellos. Willow O.	..	..	45m	79m	..
rubra. Red O.	40	46	33	27	39
tinctoria. Black O.	25	32	..	..	..
Robinia pseudoacacia. Black Locust	35	54	..	..	42†
Salix babylonica. Babylon Weeping Willow	45	96	..	..	..
pentandra. Laurel Willow	..	..	..	..	75m
Tilia americana. American Linden	40	46	33	27	51†
Ulmus americana. American Elm	..	..	47	46	57†

*Facts derived from "Practical Arboriculture" by John P. Brown.

‡Facts derived from Central Experiment Station, Ottawa, Canada.

†Facts derived from "Trees in Winter" by Blakeslee and Jarvis. These trees were 3 in. in diameter when planted.

m Facts derived from miscellaneous sources.

Chapter XIV

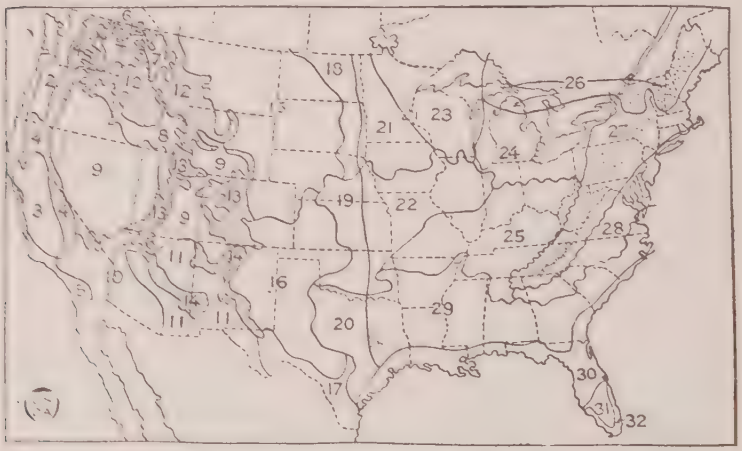
REGIONS OF THE UNITED STATES*

Region 1

Region 1 comprises the Pacific Coast west of the Coast Range, from Santa Cruz Bay to the Canadian line. Its characteristics are cool, dry Summers with frequent fogs and heavy Winter rainfall, with the lowest temperatures 8 to 10 degrees below freezing in the North to about freezing in the South.

In the northern part of this region most of the native trees of the Eastern United States and those of Western Europe may be grown.

Some of the more important deciduous trees are London Planetree, English Elm, Oregon Maple, Madrone, European Linden, California Walnut, Black Walnut, American Elm, Huntingdon Elm, California Planetree, Honeylocust, and Common Locust, closely followed in desirability by



MAP OF THE UNITED STATES

Showing by numbers within heavy border lines regions having approximately similar growing conditions. The stippled areas are mountain regions—(From Farmer's Bulletin No. 1482)

* This discussion of regions is taken from "Trees for Roadside Planting" by F. L. Mulford, U. S. D. A. Farmer's Bulletin No. 1482.

White Ash, Green Ash, European Ash, Red Oak, White Oak, Pin Oak, Ginkgo, American Linden, Sugar Maple, Sycamore Maple, and Norway Maple.

Evergreens likely to succeed in the southern part are the Redwood, the California Live Oak, Deodar, and Giant Sequoia.

Region 2

Region 2 includes the Willamette Valley in Oregon and the region of similar climate north of it in Washington, including the shores of Puget Sound. The Summers are warmer and drier than in region 1, and the average lowest temperatures are from 10 degrees to 20 degrees F.

Deciduous trees likely to be most successful in this region are Oregon Maple, Madrone, Chestnut, Honeylocust, White Oak, Sugar Maple, California Walnut, Black Walnut, Cascara Buckthorn, and Black Locust; those rather less uniformly adapted are English Elm, London Planetree, American Planetree, American Elm, Sycamore Maple, Tuliptree, European Linden, American Linden, White Ash, Green Ash, European Ash, the Hickories, English Oak, Red Oak, Pin Oak, and Ginkgo.

Region 3

Region 3 comprises the Sacramento and San Joaquin Valleys in California. This region has hot, dry Summers and mild Winters with 15 to 20 in. of rainfall. The temperature drops to 8 or 10 degrees below freezing on the valley floor with slightly higher temperatures on the hillsides. Alkali is often present.

Trees best suited to most of this region are London Planetree, California Walnut, American Elm, English Elm, California White Oak, Velvet Ash, California Planetree, Oregon Ash, Flowering Ash, Goldenrain-tree, Oregon Maple, Honeylocust, and California Live Oak. Some that are not so desirable are Madrone, Lombardy Poplar, Carolina Poplar, Cottonwood, Norway Maple, Silver Maple, Common Locust, and Ailanthus.

In the southern part of the region there are several evergreen trees that are desirable, including some of the Eucalypts, such as Blue Gum, Red Gum, Manna Gum, and Gray Gum; also Arizona Cypress, Deodar, California Incense-cedar, Monterey Pine, Aleppo Pine, Bottle-trees, and the California Bigtree; palms may be used for formal effects and the Acacias where small trees are needed. Additional deciduous trees for the southern part are Athel, Texas Umbrella-tree, and Chinaberry.

Region 4

Region 4 includes the Sierra Nevada and Cascade Ranges. Conditions here vary considerably according to elevation and slope, the eastern side of the mountains being much drier than the western. Many native trees are excellent at the different altitudes, but at lower levels the valley plants are suitable.

Among the deciduous trees for this region are London Planetree, common Locust, English Elm, Oregon Maple, American Elm, Mossycup Oak, and Chestnut. Good evergreens are Southern Magnolia, Incense-cedar, Sugar Pine, and Digger Pine. The native Madrone is good for the northern half of the region, while the Giant Sequoia, or Bigtree, is suited to elevations of 3500 to 8000 ft.

Region 5

Region 5 comprises the coast west of the Coast Range from Santa Cruz to Santa Barbara, thence to San Diego, Redlands, and Riverside, including

what is popularly known as "Southern California." The Summers are dry, cool on the coast and warm inland; the Winters are moderately rainy, from 30 in. in the mountains to 10 in. in the valleys, being nearly free from frost on the coast and in the foothills.

This is a region primarily for evergreen trees, but deciduous trees adapted to it are London Planetree, California Walnut, Velvet Ash, English Elm, Valley White Oak, Goldenrain-tree, Silktree, Beefwoods, and such short-lived trees as Athel, Chinaberry, and Texas Umbrella-tree.

Among the evergreens are: California Live Oak, Cork Oak, Arizona Cypress, Camphor-tree, Rubbertree, Guadalupe Cypress, Peppertree, several Eucalypts (such as Blue Gum, Red Gum, Sugar Gum, Lemon Gum, Port Gregory Gum, Manna Gum, Redbox, and Desert Gum), Monterey Cypress, Monterey Pine, Carob, California Incense-cedar, Deodar, Smooth Cypress, Aleppo Pine, Silk-oak, various palms for formal effect, and where dwarf trees are desirable Acacias and Pittosporum.

Region 6

Region 6 is the Columbia River Valley in Eastern Washington. The Summers are warm; the Winters have ordinary temperatures of 10 to 15 degrees F., with extremes occasionally of zero. The annual rainfall varies from 7 to 20 in., mostly in Winter and Spring.

Deciduous trees for this section are London Planetree, English Elm, European Lindens, Green Ash, common Locust, European Ash, White Ash, Norway Maple, and Red Oak.

Evergreen trees are Western White Pine, Colorado Juniper, Western Redcedar, Alberta Spruce, and Western Yellow Pine.

Region 7

Region 7 includes the plateau of the eastern part of the State of Washington and the valleys of Northern Idaho and Western Montana. The Summers are warm, and the lowest Winter temperatures range from zero to 15 degrees F., with an annual rainfall of 10 to 20 in.

Deciduous trees for this region are Green Ash, Honeylocust, common Locust, Norway Maple, Sycamore Maple, and several of the Poplars, including the Cottonwood, Carolina Poplar, Silver Poplar, Black Balsam Poplar, Balsam Poplar, and Quaking Aspen.

Some trees suitable to special localities within this region are Red Oak, Chestnut Oak, Scotch Elm, English Oak, Scarlet Oak, European Lindens, Corkbark Elm, and English Elm.

Region 8

Region 8 is the Snake River Plains and the Utah Valley. It is a semi-arid country with water available for irrigation. The Summers are hot and the Winters often have minimum temperatures of zero to 10 degrees below F., with a rainfall of 9 to 15 in., mostly in Winter.

The most promising trees for this region are Green Ash, Honeylocust, and common Locust. Trees adapted to portions of this country are Corkbark Elm, Norway Maple, Sycamore Maple, many of the Poplars, and the Silver Maple in moist situations protected from winds.

Promising evergreens are Colorado Juniper and Smooth Cypress.

Region 9

Region 9 is the northern part of the great arid interior plateau included in the States of Oregon, Nevada, and Utah. Its characteristics are hot

days and occasional frosty nights in Summer, with cold Winters and about 10 in. of rainfall annually.

The most promising trees for this region are Green Ash, Honeylocust, common Locust, Boxelder, and Cottonwoods (including Bolleana Poplar, Fremont Cottonwood, Siberian Poplar, Petrovski Poplar, Smoothbark Cottonwood, and Narrowleaf Cottonwood).

Region 10

Region 10 includes all the southwestern desert, including portions of California, Arizona, and a corner of Nevada. The climate is hot to scorching, with a rainfall of 3 to 10 in.

The most promising deciduous trees for this region are Athel, common Locust, native Cottonwoods, Nogal, Honeylocust, Mexican Walnut, Green Ash, Chinese Elm, and Boxelder.

Perhaps better suited than the deciduous trees to the conditions found in this region are some of the evergreens, such as the Desert Gum, Red Gum, Redbox, Jerusalem-Thorn, Carob, and palms (including Texas Palmetto and the Washington palms).

Region 11

Region 11 comprises the southern part of the great arid interior plateau included in the States of New Mexico and Arizona. Its characteristics are the same as the plateau farther North (region 9) except that the temperatures are higher.

The most promising deciduous trees for this section are Honeylocust, Green Ash, common Locust, Nogal, Mexican Walnut, Desertwillow, Hackberry (both the common form and the Mississippi Hackberry), native Cottonwoods, and other Poplars. The Chinese Elm will do well in naturally well watered valleys or on ditch banks.

Trees that ordinarily are not so desirable as the foregoing but which will probably stand drought as well and help to give variety are Chinaberry, Texas Umbrella-tree, and Boxelder.

Two evergreens that with irrigation are likely to prove as satisfactory as any trees in this region are Jerusalem-thorn and Texas Palmetto, while Eucalyptus would do well on banks of irrigation ditches or other moist places.

Region 12

Region 12 is that part of the Rocky Mountains included in Idaho, Montana, Wyoming, Washington and Oregon. The temperature and rainfall vary greatly, depending on elevation and exposure. Many places are suitable for a great variety of plants; others are suited only to a few.

Green Ash and Hackberry are the trees most to be depended upon in region 12, although in many parts of this territory Boxelder and some of the Poplars also are successfully grown, such as Southern Cottonwood, Narrowleaf Cottonwood, Smoothbark Cottonwood, Silver Poplar, Quaking Aspen, Balm-of-Gilead, Black Balsam Poplar, and Balsam Poplar. Suitable evergreens are Colorado Juniper and Western Yellow Pine.

Other trees that do well under favorable conditions are American Elm, if watered the first few years, Red Oak, Black Walnut and Corkbark Elm.

Region 13

Region 13 includes the Rocky Mountains of Utah and Colorado and is similar to the region farther North, except that the temperatures for the

same elevation are about 7 degrees warmer. The trees that can be used at an elevation of 4000 ft. in region 12 can be used at 6000 ft. in this region.

Green Ash and Goldenrain-tree are perhaps the two most satisfactory trees for this section, although the Southern Cottonwood and some of the other Poplars are also desirable. Other good trees are the common Locust, Hackberry, Honeylocust (especially the thornless form), Chinese Elm, and Colorado Juniper. A less valuable tree that does well here is the Boxelder.

Region 14

Region 14 is the Rocky Mountains of Arizona and New Mexico. It is similar to the region farther North except that temperatures for the same elevation average about 6 degrees warmer than in region 13, and 13 degrees warmer than in region 12. Allowing 3 to 4 degrees of temperature for each 1000 ft. of elevation would make possible the growing of any particular tree in region 14 at an elevation 1500 ft. higher than in region 13 when the moisture conditions are similar.

Among the trees succeeding in this section are Green Ash, common Locust, Hackberry, Thornless Honeylocust, Goldenrain-tree, some of the Poplars, or Cottonwoods. Nogal, Mexican Walnut and Emory Oak can be used in well watered valleys and along ditch banks. Boxelder is worth trying where the others fail.

Region 15

Region 15 is the Northern Great Plains area south to Kansas and Colorado, extending from about 5500 ft. contour on the West to the black soils on the East. It is extremely cold in Winter in the Northeastern portions, usually dropping to 30 or 40 degrees F., while close to the mountains it is 20 degrees warmer. The Summers are moderately warm. It is generally recognized as the northern part of the dry farming area, with a rainfall of about 15 in.

Only the hardiest and toughest plants can be grown here. Green Ash, Common Hackberry, Chinese Elm, Balsam Poplar, Black and Golden Willows, American Larch and Boxelder are the most promising trees. When water is available for a few years American Elm will be likely to become established, and in parts of the region at least there may be grown Mossycup Oak, Black Walnut, Western Yellow Pine, and Colorado Juniper. In the colder sections, as in North Dakota, and in the higher elevations of the Black Hills in South Dakota, the Golden Willow and the Black Hills Spruce may be used.

Region 16

Region 16 is the central portion of the Great Plains, including the Plains portions of Kansas, Oklahoma and New Mexico; also portions of the Plains in Colorado and Texas. It extends eastward from about the 6600 ft. contour on the West to the black soils on the East. The rainfall varies from 12 to 22 in. The climate is warmer and has a greater evaporation than in region 15. It is the southern portion of the dry farming area.

The trees most likely to be satisfactory in all parts of this section are Hackberry, Southern Cottonwood, Green Ash, Common Locust, Chinese Elm, and American Elm if watered the first few years.

Other trees that are likely to succeed over most of this territory are American Planetree, Red Ash and Silver Poplar. Less desirable trees that may be useful under especially trying conditions are Boxelder, Osage-orange, Russian-olive and Russian Mulberry.

In the warmer portions, as in parts of Texas and New Mexico, Chinaberry, Texas Umbrella-tree, and Paper-mulberry may be grown, together with such evergreens as Jack Pine, Western Yellow Pine, Redcedar, Deodar and Arizona Cypress.

Region 17

Region 17 is the dry hot portion of Southwestern Texas, with 12 to 22 in. of rainfall, but excessive evaporation.

The most promising trees for this section are the Jerusalem-thorn, Chinese Elm, Canary Date Palm, Washington Palms, Athel, Chinaberry, Cottonwoods, Texas Umbrella-tree and Cats-claw, while Texas Palmetto, Victoria Palmetto, and Cabbage Palmetto succeed. In many parts other trees may be grown, such as Honeylocust, Common Locust, Green Ash Silver Poplar, Paper-mulberry, and White Mulberry. Where the foregoing do not thrive it is possible that Boxelder, Russian-olive, Black Willow, and Osage-orange may be grown, while the Live Oak may prove to be suitable in the moister situations. The native Mesquite is one of the most valuable trees of this region for roadside planting, but those collected from the wild are hard to transplant because of lack of preparatory root pruning and a corresponding lack of a well developed root system that can be moved with the tree. When they can be saved near the road it certainly should be done.

Region 18

Region 18 is the subhumid black-soils country lying east of the dry-farming area of the Northern Great Plains and is intermediate as to moisture between region 15 and the more humid area to the east of it. The Winters are very cold and dry.

Probably the most useful trees in this section are the Green Ash, Common Locust, Cottonwoods and, where the others do not succeed, the Boxelder and Willows. Slower growing trees that are likely to be satisfactory are Mossycup Oak, Chinese Elm, Colorado Juniper and Jack Pine.

Region 19

Region 19 is the subhumid black-soils area of Kansas, Southern Nebraska and much of Oklahoma. There is more moisture than in the dry-farming country to the west of it and less than in the area farther east. It is a locality of sudden variation in Winter temperatures and of hot winds in Summer.

Trees suited to this region are the Mossycup Oak, Chinese Elm, Goldenrain-tree, Hackberry, Common Locust, Honeylocust, Green Ash, American Elm if watered for a few years after transplanting, Red Oak, Pin Oak and American Planetree. Other good trees that can be used in many parts of the region to advantage are Post Oak, Cork Elm and English Elm. Where other trees do not succeed the Poplars can be used, such as Southern Cottonwood, Carolina Poplar, Fremont Cottonwood and Narrowleaf Cottonwood; also the Ailanthus.

Region 20

Region 20 is the subhumid or transition region of central Texas with black and chocolate colored soils. In moisture conditions it is intermediate between the dry-farming regions farther West and the humid climate of Eastern Texas.

Among the best trees for this section are the Pecan, Mississippi Hackberry, Cedar Elm, Chinese Elm, Mossycup Oak, Goldenrain-tree, London Planetree, American Planetree, Willow Oak, Texas Red Oak, Southern Red

Oak, Pin Oak, Post Oak, Chinquapin Oak, Green Ash, and Black Walnut, with Bottletrees for the southern part.

Available evergreen trees are Live Oak, Laurel Oak (often called Water Oak), Redcedar, Deodar, Arizona Cypress, and Loblolly Pine.

Region 21

Region 21 is in the Northern part of the prairie country, with frequent droughts of more than 30 days in the Western portion and cold Winters with drying winds. The rainfall is 20 to 30 in., occurring mostly in the Summer season.

The most dependable trees for this region are the Green Ash, American Elm, Mossycup Oak and American Linden. Other good trees are Red Oak, Chinese Elm and Red Maple, followed by Red Ash, Pin Oak, Norway Maple and Hackberry.

If evergreen trees should be desired, the White Spruce and Red Pine are adapted to this section.

Region 22

Region 22 is that portion of the prairie country having higher temperatures than region 21, but subject to similar cold drying winds in Winter. The rainfall is 30 to 40 in.

Trees adapted to these conditions are American Elm, Red Oak, Black Walnut, American Planetree, Mossycup Oak, White Ash, Green Ash, Pecan, White Oak, Kentucky Coffeetree, Pin Oak, Hackberry, Chinese Elm, Black Cherry, Southern Cottonwood and Carolina Poplar.

Region 23

Region 23 is the western part of the Great Lakes forest area. The eastern portion is slightly warmer and more humid than the western portion, the latter much resembling region 21.

Here the useful trees are American Elm, Red Oak, American Linden, Sugar Maple, Chinese Elm, White Ash, Mossycup Oak, Green Ash, Hackberry, Swamp White Oak, Red Maple and Norway Maple.

Available cone-bearing trees are White Spruce, Red Pine, Austrian Pine, White Pine, Scotch Pine, Jack Pine and American Larch.

Region 24

Region 24 is largely that part of the country influenced by the Great Lakes, lying East of Lake Michigan, extending south into Ohio and Eastward to Lake Ontario. There is considerable moisture in the atmosphere, in addition to a rainfall of 30 to 40 in., rather well distributed through the year. The Winter temperatures are more moderate than in region 23, and there is usually a good snow covering.

Many species of both native and introduced trees will thrive here, some of the best of the deciduous kinds being Sugar Maple, American Elm, Red Oak, Black Walnut, American Linden, White Oak, White Ash, Mossycup Oak, Scarlet Oak, Swamp White Oak, followed closely by Red Maple, Tupelo, American Planetree, Slipper Elm, Kentucky Coffeetree, Norway Maple, Beech and Ginkgo. For the southern portions there may be added Tuliptree, Pin Oak, Shingle Oak, London Planetree, Shagbark Hickory and Pignut.

Region 25

Region 25 includes the Ohio and lower Tennessee River valleys and the Ozark Mountain region. The Winter temperatures are rather moderate

with much alternate freezing and thawing; the Summer is warm with a 30 day drought often occurring near its close. The rainfall is 40 to 50 in.

A large number of native and introduced trees are available here, some of the best of which are Red Oak, Sugar Maple, Tuliptree, Black Walnut, American Planetree, American Elm, Mossycup Oak, Pecan, Sweetgum, White Oak, Scarlet Oak, Pin Oak, Cucumbertree, American Linden, White Ash, London Planetree, Swamp White Oak, Southern Red Oak, Chestnut Oak, Shingle Oak, Red Maple, Ginkgo, Tupelo, Bigleaf Magnolia, Beech and Hickories.

Region 26

Region 26 includes the colder sections of the eastern United States, comprising much of Maine, the mountainous portions of New Hampshire, Vermont, and New York, and a part of Northern Michigan. It is characterized by cold Winters, with heavy snowfall and short Summers of long days and cool nights with abundant rainfall.

Because of the severe Winters, fewer deciduous trees thrive here than in the regions to the South; but the native vegetation has many coniferous evergreens that may be used whenever this type of tree is desirable.

Deciduous trees that will succeed in this region are American Elm, Red Oak, Sugar Maple, White Ash, Birches (including Yellow, Sweet, and Canoe), American Linden, Red Maple, Shagbark Hickory, Black Maple, Striped Maple, Beech, Black Willow, Balm-of-Gilead, Poplar and Large-tooth Aspen, with such cone-bearing trees as White Pine, Red Pine, White Spruce, American Larch, Hemlock, and Arborvitae.

Region 27

Region 27 is the Appalachian Mountain country, including much of New England and New York, most of Pennsylvania, and the mountainous portions of the States Southward. The rainfall is abundant, usually from 35 to 50 in., and is well distributed through the season.

Most of the trees native to the cooler portions of the temperate zones thrive under the conditions found here. Some that stand at the head of this large list are Red Oak, Sugar Maple, American Elm, Mossycup Oak, American Linden, White Ash, White Oak, Red Maple, London Planetree, American Planetree, Tuliptree, Swamp White Oak, Chestnut Oak, Black Oak, Scarlet Oak, Pin Oak, Ginkgo, Tupelo, Black Walnut, and the Shagbark and Pignut Hickories.

Region 28

Region 28 lies just east of region 27 and includes the Piedmont section and some adjoining parts with similar growing conditions. It extends from Northern Alabama Northeasterly across the Carolinas and Virginia to New Jersey and the coast of Massachusetts. It is warmer than region 27, with abundant rainfall except in late Summer when a 30-day drought occasionally occurs. The Winters are open, with much freezing and thawing, and but little snow protection is to be relied upon.

Some of the best deciduous trees for this region are the Red Oak, Willow Oak, White Oak, Tuliptree, Red Maple, Pin Oak, Black Walnut, American Elm, London Planetree, American Planetree, Swamp White Oak, Chestnut Oak, Mossycup Oak, Shingle Oak, Scarlet Oak, Black Oak, American Linden, White Ash, Sweetgum, Tupelo, European Lindens, English Elm, Ginkgo, Sugar Maple, and the Shagbark, Pignut and Mockernut Hickories.

Region 29

Region 29 includes most of the cotton country extending from Eastern Texas eastward and northward to the Atlantic Ocean in North Carolina and Virginia. It lies between the Piedmont region and the swampy lower coastal plain that borders the Gulf of Mexico and the Atlantic Ocean.

The rainfall is abundant (45 to 60 in.) except toward the last of the rather warm Summer, when a long drought frequently occurs, particularly in the western portion.

This is another region most favorable for tree growth, some thriving here that do not succeed farther north, while but few of the more northern trees are not successful. Some of the more desirable trees are Live Oak, Willow Oak, Pecan, Sweetgum, Laurel Oak, Darlington Oak, Southern Red Oak, Red Oak, Tuliptree, American Elm, American Planetree, London Planetree, Mossycup Oak, Overcup Oak, Pin Oak, White Ash, Tupelo, Red Maple, Ginkgo, Winged Elm, and American Beech. Evergreen trees in addition to Live Oak, the almost evergreen Laurel Oak, and the Darlington Oak are Southern Magnolia, Holly, Longleaf Pine, Shortleaf Pine, Loblolly Pine, Deodar and Redcedar.

Region 30

Region 30 is the swampy Coastal Plain, from Wilmington, N. C., southward along the Atlantic Ocean and westward along the Gulf of Mexico. It has moderate Summer temperatures with hot sunshine, short Winters, an abundance of rainfall (50 to 60 in.) except in the Texas portion, and is almost subtropical.

The list of trees suited to this section is not so large as for those sections farther inland with heavier soils, but there is ample choice among excellent kinds. Some of these are Live Oak, Laurel Oak, including Darlington Oak, Sweetgum, Pecan and other Hickories, Willow Oak, Southern Red Oak, American Planetree, London Planetree, Red Maple, Mississippi Hackberry, Ginkgo, American Elm, with such broad-leaf evergreens as the Live Oak and Laurel Oak already mentioned, Southern Magnolia, and Holly. For formal or tropical effects some of the palms may be used, such as the Cabbage Palmetto, Washington Palms, Canary Date Palm, and the Chinese Fan Palm. Among the cone-bearing trees are the Longleaf Pine and Baldcypress.

Region 31

Region 31 is Southern Florida with the exception of the subtropical fringe. It is subject to annual frosts, rather warm Summers, and a rainfall of about 50 in. The vegetation approaches the subtropical, Oranges, Palms, and the Grevillea, or Silk-oak, succeeding.

This is a region where evergreen trees should be largely used, such as Live Oak, Silk-oak, Laurel Oak, Camphor-tree, Southern Magnolia, Rubbertree, Holly, Beefwood, and Jacaranda, while among the Eucalyptus being tried to some extent are the Swamp Mahogany, Red Gum, Manna, and Gray Gum. If deciduous trees are desired perhaps the most satisfactory are Red Maple, Tupelo, Pecan, native Hickories, Sweetgum and Baldcypress.

Palms also succeed, such as the Canary Date palm, Washington Palms, *Cocos plumosa*, Chinese Fan Palm, and Cabbage Palmetto.

Region 32

Region 32 is the subtropical coast of Southern Florida. It has a slight range of temperatures with seldom a killing frost and a rainfall of 50 to 70 in. Palms and mangroves are the typical vegetation.

The trees here would be the broadleaf evergreens and palms, such as the Live Oak, Silk-oak, Camphor-tree, Rubbertree, Southern Magnolia, Beefwoods, Laurel Oak, Jacaranda, Pittosporum, and Holly, while some of the Eucalyptus, like Swamp RMahogany, ed Gum, Gray Gum, and Manna gum, may be worth trying.

The Royal Palm is the most characteristic palm of this region, while the Cabbage Palmetto is striking in a small area. Others that thrive are the Canary Date Palm, Washington Palms, *Cocos plumosa*, and Chinese Fan Palm.

How to Dwarf Trees

Naguro Sakurai, head gardener to the Emperor, explains the secret of dwarfing trees.

"Bonsai, the art of dwarfing trees and shrubs," says Mr. Sakurai, "has been practiced by Japanese gardeners for centuries. Today there are bonsai clubs all over Japan and there's even a monthly magazine devoted to the subject."

Almost any tree, shrub, or vine can be dwarfed successfully. Buy young (2 or 3-year-old) untrained specimens from your local nurseryman. The following list contains the names of plants especially suitable for this purpose: Crabapple, Cryptomeria, Elm, Fir, Flowering Cherry, Gingko, Hemlock, Juniper, Larch, Lemon, Maple, Monterey Cypress, Oak, Orange, Persimmon, Pine, Pomegranate, Tamarisk, Willow, and Wisteria.

In the West, October and November are the best months to start dwarfing deciduous plants, Mr. Sakurai tells us. February and March are the best times for evergreens.

Vital factors in training dwarfed trees are:

1. Confining the roots to a small container, supplemented by trimming back the thick, main roots as much as one-half or two-thirds and leaving a remainder of fine feeding roots.

2. Packing the soil tightly around the roots. Instead of ramming the soil with a blunt-ended stick, use a pointed one. This packs the soil *between* the small roots as well as on top. The soil should be well moistened for this purpose.

Soil for dwarf plants should be light and porous—one-third leafmold, one-third sand, and one-third sandy loam is the best mixture.

Watering is important. Furnish *light* waterings *only* when the surface is parched. Too much moisture is worse than too much dryness.

Main training and pruning is done from February to April, when the specimens are in active growth. In general, the purpose of the pruning is to restrain strong branches and nip them back into neat tips.

Rape seed meal is the only fertilizer that can be recommended and it should be used once a month from March to July. One cupful should be dissolved in four cupfuls of water for 20 days. Then dilute this with 15 times as much water. Apply just enough to moisten the soil surface.

March and April is repotting time. Some of the fast-growing specimens, Maples for example, need new soil each year. Slower plants, such as Pines, can be left for three to four years. Trim off large and rotten roots when repotting. New feeder roots will quickly develop.

—*Sunset Magazine*

Chapter XV

STREET TREES

The tree lined streets of some cities are more remembered than speedways. Some cities have done nobly in preserving the trees of their inheritance: other communities have not as yet come to a full realization of the assets of shaded streets.

WHAT ARE THE BEST STREET TREES?

Of course, the first requisite of a shade tree is that it will grow under the conditions prevailing in the city street. It should not be dropping mussy flowers, fruits nor leaves all Summer. It should not sucker nor should the roots approach too close to the sidewalks so that they heave the stones. It should have a long season of beauty. It should be adapted to the width of the street. It is well to have the residents of a street accept one definite species of tree. One species gives uniformity and should they become infested with insects, the trees can be sprayed more easily.

The best street trees for various regions are given in *U. S. D. A. Farmer's Bulletin* 1208. From these lists the writer has chosen the most valuable.

PACIFIC NORTHWEST: (Trees native of Western Europe and most American trees, especially) Oregon, Norway, Sycamore and Sugar Maples; California Walnut, Tuliptree, European Linden, Basswood, London Planetree, White Ash, English and American Elm, and English Red and Pin Oaks.

PACIFIC COAST OF CALIFORNIA: (Water is the limiting factor) London and California Planetrees; English, Huntingdon, and American Elms; Oregon, Norway and Sycamore Maples; White, Green and European Ash; Red, Live, English and Pin Oaks; European Linden, Basswood, Honeylocust, Albizzia, Sterculia, Eucalyptus, Acacias, Peppertree, Silk-oak.

SAN DIEGO (CALIFORNIA): Carroll De W. Scott in "California Garden" recommends: *Cocos plumosa* Palm alternating with *Eugenia myrtifolia*; Windmill Palms (*Chamaerops* sp.) or Guadalupe Palm

(*Erythea edulis*) alternating with *Pittosporum tobira* or *P. undulatum*; Victorian Redbox Eucalyptus (*E. polyanthemos*) alternating with *Hibiscus*, the queen of sidewalk shrubs; Peppertree or Camphor alternating with *Cotoneaster pannosa*, *Leptospermum*, and *Tecoma capensis*.

Great Plains: Thornless Honeylocust, Hackberry, Black Locust, Green Ash, Boxelder, Poplars, Chinese Elm.

Upper Mississippi Valley: American Elm, Red, Pin and Bur Oaks; White Ash, Planetree, Basswood, Norway and Sugar Maples.

New England and Midwest: Red and Pin Oaks, London Planetree, Ginkgo, Tuliptree, Norway Maple, White Ash, Thornless Honeylocust, and American Elm.

Gulf States and Florida: Laurel; Darlington, Spanish and Live Oaks; Sweetgum, London Planetree, American Elm, Ginkgo, Evergreen Magnolia.

Southern Florida: Willow, Spanish, Live, Laurel and Southern Red Oaks; American Elm, Mississippi Hackberry, Poinciana, Evergreen Magnolia, Camphortree, Rubbertree, Silk-oak, Casuarina.

Bad Street Trees

Boxelder, *Acer negundo*. Rapid but unsightly growth

Cottonwood, *Populus*. The female tree fills air with cotton when shedding seed

Gum, *Eucalyptus*. Many sorts sucker too freely; others enter sewers.

Maple, Soft, *Acer dasycarpum*. Weak branches; short lived

Paper-mulberry, *Broussonetia papyrifera*. Suckers too freely; tender

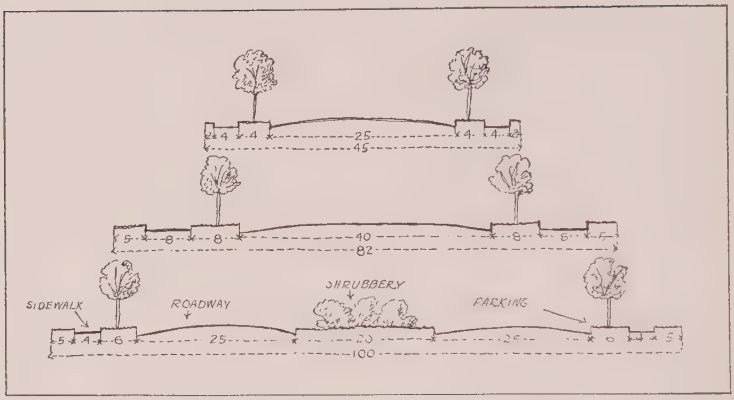
Poplar, Carolina, *Populus*. Suckers freely

Willows, *Salix*. Wood weak

Distances

The usual street trees should be planted alternately on each side of the street in the grass parking strip if it is at least 4 ft. wide, although a wider space would give the trees more opportunity for root development and also be more attractive. Give each tree at least 35 ft. It is a common mistake to plant the trees too thickly because it takes a brave heart to cut down a tree when it starts to crowd. Elms and White Oak should have as much space as 50 ft.; Planetree and the Sugar and Soft Maples, 45 ft., whereas the Red Maple and the Norway Maple being more compact require 40 ft.; Ginkgo is upright and 30 ft. is sufficient. It is wise to space the trees at regular intervals without regard to property lines; hence the planting should be planned by the community forester and not by individual property owners.

Each city has its own ordinances governing the width of the road and grass strip. Under no circumstances set a tree closer than 2 ft.



PLANTING STREET TREES

Note the methods used for streets of various widths: 25 ft., 40 ft. and a double 25 ft. drive with a 20 ft. parkway in the center

from the curb. The passing vehicles are sure to remove the bark from the trunk.

John F. Monahan* writes:

If the tree belt is only 2 ft. wide, the tree should be planted 2 ft. from the curb and the paved portion should be cut out to allow 12 in. of open ground on the side toward the pavement.

If the tree belt is 4 ft. wide, set the tree in the center of it, allowing 2 ft. of space on each side. If it is 8 ft. wide the best arrangement is to follow the line of the existing trees, unless these are less than 2 ft. from the curb. In this latter instance you must establish a new line where it should be in the center of the tree belt, i.e., 4 ft. from the curb.

Care must be taken in the longitudinal spacing to escape sewer, water and gas connections. To set the trees (40 ft. apart) an equal distance apart requires careful planning.

It is far better to set the trees between the walk and the lawn rather than near the curb because†

1. Protection. The tree roots are not cut in making street repairs.
2. Food. The trees usually have better soil.
3. Overhead interference. Overhead wires would not be so likely to interfere with the growth.
4. Appearance. The streets appear wider.
5. Seclusion. The house is more screened from the street.

*Ann. Rept. of the Dept. of Parks of the City of Newark, New Jersey, 1919.

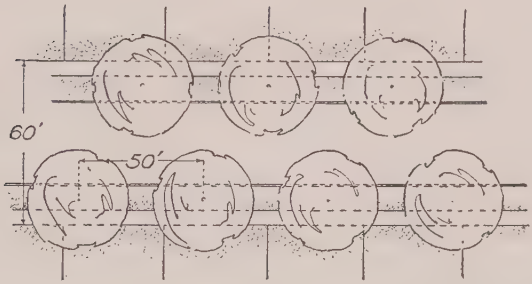
†This is the advice of City Forester Gale of Springfield, Mass.

How Much is a Tree Worth?

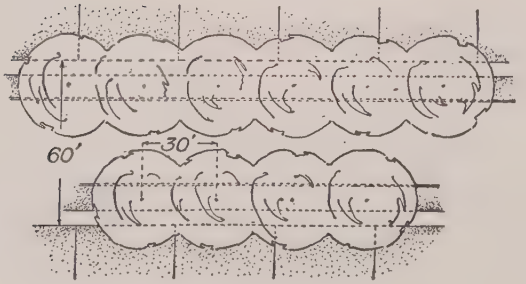
We could answer this question very indefinitely and merely say that a tree is just as valuable as we think it is. But C. N. Ruedlinger in speaking before the Northern Nurserymen's Association says that we must evaluate trees according to some definite scheme. He said:

Some eastern cities take inventory of their trees yearly. Hartford, Conn. for instance, values the trees on Washington Street, the most

Spacing For City Trees



Suggested tree spacing



Present improper tree spacing

From "City Tree Planting," by T. Glenn Phillips, Detroit City Planner

prominent street in the city, at $37,500 for 271 trees, or $138.41 for each.

Further figures, showing the appraised value of each tree in certain cities, will give a more general idea of average worth. Newton, Mass. values each of its street trees at $120.50; Newark, N. J., $30.72, replace value; Springfield, Mass., $100; Ann Arbor, Mich., $100.

Some years ago Filbert Roth, dean of forestry at the University of Michigan, recommended that in estimating a tree's value the cost of establishing it, $15, plus compound interest for twenty-five years, before it becomes of any benefit, be the method of computation. A tree at that age would therefore have a value of $51.80, to which may be added the cost of caring for it during that time.

Mr. Ruedlinger mentioned five other methods of computation, in each of which the measurement is taken at a point breast-high from the ground. These are as follows: 1, circumference method, allowing a valuation of $5 per circumference inch; 2, diameter method, $10 per diameter inch; 3, Parker method, $75 per square foot; 4, Colton method, 75c. per square inch; 5, Newark method, $1 per square inch. In each of these, defects, species and other factors are considered.

Some of these methods vary considerably as to the value of a tree, Mr. Ruedlinger said. For instance, a tree 18 in. in diameter measured breast-high, or 4½ ft. would have the following respective values according to the scales just given: $265, $180, $132, $201 and $268, provided the tree were perfect. Where trees are of such size and variety that they can be replaced with the same size, a replacement value is figured, including the cost of removing the dead tree and, if necessary, providing new soil.

Having at different times been called upon to give a valuation of trees, I have felt the need of some approved, standard system, with more detailed explanations for doing such work. Therefore, about two years ago I worked out a classification and score card, the classification applying to the Minneapolis territory only, which was approved by a number of men familiar with the value of trees. This system I have been using since.

Mr. Ruedlinger's classifications are as follows:

Landscape Trees

First class, 100 per cent—Elm, Hackberry, Sugar Maple, White and Bur Oak, American Linden and White Ash.

Second class, 90 per cent—Green Ash, Wier Maple, Birch, Lombardy and Bolleana Poplars and Weeping Willow.

Third class, 75 per cent—Norway, Silver, Red and Schwedler Maples; Catalpa, Buckeye, Red Oak.

Fourth class, 55 per cent—Honeylocust and Thornless Honeylocusts, Black Walnut, Black Oak.

Fifth class, 40 per cent—Boxelder, Willow, Black Locust, Mountain-ash, Red Elm and all Poplars, with the exception of Lombardy and Bolleana.

Street Trees

First class, 100 per cent—Elm, Hackberry, Sugar Maple, American Linden, White Ash.

Second class, 90 per cent—White and Bur Oak, Green Ash, Norway Maple.

Third class, 75 per cent—Thornless Honeylocust, Silver and Red Maple, Catalpa.

Fourth class, 55 per cent—Red Oak, Black Walnut, Butternut, Black and Honeylocusts.

Fifth class, 40 per cent –Boxelder, Black Oak, Birch, Red Elm and all Poplars.

Mr. Ruedlinger's score cards for landscape and street trees are as follows:

	Landscape Trees	Street Trees
Situation in regard to locality	10	10
Vitality	10	10
Maturity	10	10
Susceptibility to insects and disease	10	15
Condition of trunk	10	5
Condition of crown	15	15
Distance apart	5	15
Root system and soil	10	10
Value to landscape and buildings	20	0
Location in regard to curb, etc.	0	10

According to the classification, either a landscape or street tree of an 18-in. diameter or 58-in. circumference, measured by the first, or circumference method, at $5 per circumference in., would be valued as follows in the respective classes: $265, $238.50, $198.75, $159 and $132.50.

This valuation is based on a perfect score, which, by the score card, could never be attained, Mr. Ruedlinger told the nurserymen. Trees of transplanting size are to be figured at replace value.

Explaining the application of the classifications and the score cards, Mr. Ruedlinger continued: "To begin with, the value of a tree is established at a uniform price of $5 per circumference inch measured 54 in. above ground. As the value of trees differs according to variety, they are divided into five different classes. The first class is figured at 100 per cent; the second, at 90; the third, at 75; the fourth, at 55, and the fifth, at 40.

The score card takes into consideration the conditions under which a tree is growing, as seen above. The total score points are 100, but, of course, no tree can make a perfect score. The total points scored establish the percentage value of the tree in the class to which it belongs. For instance, if the tree in the first class valued above at $265 scores 75 points, its value will be estimated as follows: Circumference, 53 in., at $5, $265; 75 points, or 25 per cent off, $66.25; value of the tree, $198.75. The tree in the third class scoring the same number of points will be reduced 25 per cent of that amount, because that class is considered to have that much less value than the first class.

Public Control of Shade Trees

This subject cannot be dealt with completely in this book, but the reader is referred to U. S. D. A. *Farmer's Bulletin* 1209, *Planting and Care of Shade Trees*, which deals with this topic. Each city should direct the planting so that there is greater uniformity in species, spacing and care. Poplars in the East and Eucalyptus in the West should be prohibited because they enter sewer pipes.

If you are searching for an answer to the question, "Who owns my shade trees?," refer to *The American Home*, August, 1930, to an article by Leslie Child who tells us that the laws vary in each community, but the weight of authority appears to give an abutting land owner a property right in street and highway shade trees. Such a right is, of course, subservient to the right of a municipality to remove or destroy such trees if this becomes necessary to the utility of a highway. A public service corporation may be authorized to trim trees where necessity requires, yet it must be exercised with due regard for the rights of abutting owners or liability may accrue.

A person's likes and dislikes for certain plants are usually brought about by his fortunate or unfortunate experience with such plants.

R. C. Morrison* writes:

He may dislike the Sycamore because of the dropping of its leaves or the fading of the green coloring matter, but he never attempts to analyze why such conditions exist. He does not know that the leaves drop because of the Sycamore blight and the coloring matter fades because of chlorosis, both of which conditions can be easily overcome. One always sees the effect but not the cause and is somewhat too ready to condemn. I have had some difficulty in securing harmony of street tree planting just because of some peoples dislike for the tree specified for their street, and it is, therefore, my problem to analyze the reason for preference. In view of the fact that people are hasty in condemning one tree and favoring another, the writer suggests that they make some study as to whether or not the undesirable features of whatever plant or tree they dislike can be overcome.

**A Few Suggestions on the Planting and Care of Trees and Shrubs*, Mr. Morrison is City Forester in Fort Worth, Texas.

ERNEST H. WILSON was on speaking terms with the trees of all the world. If he came across a fine upstanding specimen which had its original home in Western China, he remarked: "Well, my friend, it was 30 years ago that I first saw you on the borderland of Thibet. How it snowed that day!" Or perhaps it was a tree from South Africa, and he greeted it with the words: "Good morning, old pal, I first made your acquaintance on the veldt outside of Cape Town. It was one of the hottest days I ever knew." In a personal acquaintanceship of many years this reviewer remembers no occasion when Mr. Wilson was not able to name off-hand any tree from any country which came across his path. Usually he supplemented the identification by an account of the tree's origin, its habits, its ultimate height, and whatever faults as well as virtues it might possess.

—E. I. FARRINGTON.

Chapter XVI

ROADSIDE TREES

The day is not far distant when every roadside will be planted with trees and a new road will not be considered finished until the sides are graded and trees are planted.

Value of Highway Planting

The arguments in favor of planting our highways are so obvious that we need only to call a few of these reasons to mind:

1. Highway trees may be so planted that they frame views; bringing the beauty spots to the attention of the traveler.

2. Highway trees offer cool shade.

3. Because of the great amount of cultivated land which must be free from trees, the lack of birds is a serious problem. Our feathered friends are better insecticides than a spray pump in the orchard and garden.

4. Roadside trees prevent overheating the road surface and thus prolong its life.

5. When steep banks are properly planted they prevent erosion.

6. Highways which are beautified increase the value of the land

7. Properly planted, trees serve as a snow shed and a windbreak

8. Foreign roadsides, especially in Switzerland, are often sources of food. Fruits and nuts may be planted to serve for beauty and use.

The planting of roadsides should be carried out systematically, properly and intelligently. It should not be left to individuals but should be a community project or a public enterprise. Only when carried out in a public way can we insure the proper spraying and pruning of trees.

Be sensible in the choice of trees. Select only hardy, native trees for planting as they seem to belong to your neighborhood.

Prof. Henry R. Francis* has summarized the considerations necessary in putting through such a project:

*Roadside Trees Circ 17 N. Y State College of Forestry at Syracuse University

Would that all roadsides were as beautiful as this in Northern Illinois. Let us not rest until every citizen realizes that our next step is to shade our main arteries of travel, grade their shoulders and bring back their native beauty

1. One should study the existing trees: their size, kind and general value.
2. One should understand soil conditions.
3. Location and permanency of overhead wires and poles.
4. Width of roadside from edge of pavement to fence line.
5. Present use of land adjacent to the road.
6. Character of countryside to be preserved so as to emphasize views, vistas and special objects of interest.
7. Direction and intensity of the winds.
8. The native flora of the region to be preserved.
9. The insects prevalent in the locality.
10. The utility of the road as a traffic artery must not be destroyed by planting trees at dangerous points.

BRACING FRUIT TREES

Fruit trees are pruned and trained to produce a strong, sturdy frame to resist wind pressure and to support a load of fruit.

The correct principle is known to every fruit grower, but often one cannot visualize the result. Accidents will happen or a branch will not develop as was expected.

It is an easy matter to correct these faults, to make weak branches strong or to support branches heavily laden with fruit if certain fundamental principles are remembered.

Never put a wire or band around the trunk or a branch of a tree. The sap runs up and down the green inner bark, consequently as the tree grows it tightens the wire which chokes the branch and cuts through it.

The proper way to strengthen large branches that form the head of the tree is to bore a hole through the trunk or branch and insert an iron rod. (See page 120.)

The two ways to brace fruit trees having long flexible branches that are weakened by the weight of the fruit, are:

1. A pole is placed in an upright position in the center of the tree against the main trunk, to which it is fastened. A rope is tied to each of the branches that need bracing and fastened to the central pole, thus drawing them up to the proper position. It will look somewhat like a May-pole when finished.

2. Poles are cut the proper length and used as props extending from the ground to the branches, which are thus raised to the proper position.

ALFRED I. WILDER, *House and Garden.*

Chapter XVII

NUT CULTURE

Dr. Robert T. Morris, the eminent authority on nut culture, says that, in terms of acres, a nut tree in bearing produces food units per acre each year equal to 3500 quarts of milk, or 3000 pounds of mutton, or 2500 pounds of beef. Nut trees require less labor and fewer hands for cultivation or for harvesting than the ordinary field crops. Such trees will bear for a century.

There is a possibility that our native nuts may be more extensively cultivated in the future because recently a machine has been invented that makes the task of cracking the nuts simple. At several recent horticultural shows there have been attempts to gather together the most superior strains in the United States, with the result that we now have at least thirty varieties of American Walnuts.

Shagbark Hickory Nuts

Perhaps no nut will be as popular in the Northern States as the Black Walnut. Everyone agrees that the flavor is pleasing, and many find it superior to the English Walnut. It makes a tree which casts but little shade so that grass will grow beneath it. The Thomas variety is a superior sort which grows rapidly and is very hardy. The nut of the Stabler has a thin shell and cracks better, but the trees grow slower.

Several sorts of Pecans are now found hardy as far north as

Canada. The nuts are smaller than the southern varieties but the northern gardener will be pleased with them.

John W. Hershey, a nut enthusiast, reports that the Heartnut is a rapid grower and bears early. It is of Japanese origin and bears large foliage. The nuts are shaped like a heart; they are produced in clusters of at least twenty nuts. The flavor is not unlike that of a Butternut.

Hickories and Hazelnuts have not been as well selected for superior varieties.

It is generally conceded that the nut trees due to their tap roots are difficult to transplant but the nurseries are now root pruning them so that they transplant with ease. The trees are usually headed high so as to have as large a head as possible. Spring transplanting is best inasmuch as the roots do not callus but decay in cold soil.

Nut Trees for the Home Grounds

Dr. W. A. Murrill has discussed nut culture in *Better Homes and Gardens*, June 1930, and his remarks are of interest:

Most nut trees are real ornamentals, comely in form, stately in growth, enduring, resistant to storms, and with unusually attractive foliage. And they do not ordinarily require the same care that Apple trees demand. Accustomed to shifting for themselves in the wild state, all they need is a chance. Fertilizing, cultivating, and spraying are rarely necessary. The trees simply grow, put out their leaves in Spring, and yield their crop in Autumn. Their comeliness is natural, and no training is needed to bring it out.

Of course, there are some nut trees, like the English Walnut, that are not hardy in the North but thrive amazingly in California. The Chestnut trees of Europe and America are susceptible to a deadly canker and cannot be planted with any hope of success. The Butternut, which would be so hardy and fine for northern regions, must also be eliminated because of a serious fungous disease. Many of the Hickories, too, although free from disease, bear nuts too bitter or too small to be considered.

But one need not be discouraged. There are several other kinds that are hardy, free from disease, and just as good or even better than those just mentioned, the Black Walnut, for instance. There is hardly a region in the whole United States where it will not grow if given a soil of fair quality and depth. It is a magnificent tree and yields bushels of highly nutritious nuts. Just one of these trees about the place will supply food for generations.

Varieties of budded Black Walnuts, such as the Ohio, Stabler and Thomas, will begin to bear in a few years. The nuts crack rather easily. Not long ago a variety was discovered that cracks into two

Catkins and nuts of Improved European Filberts

halves like the English Walnut. This should be on the market in the near future.

Where the soil is rocky or shallow the Shagbark Hickory should be used instead of the Black Walnut. The nuts are finely flavored, and several promising varieties have been discovered. One of the most attractive is the Vest Hickory, found at Blacksburg, Virginia.

If the space is small, hybrid Chestnuts or Hazel nuts may be used. The Japanese Chestnut is highly resistant to the Chestnut canker, as is also our native eastern Chinquapin. By crossing the two, practically immune strains have been obtained that will fruit in a very few years. The European Filbert, unlike our native Hazels, grows to be 20 or 30 ft. high. The Hazel blight has been rather discouraging, but by cutting out the diseased shoots at an early stage, the disease may be fairly well controlled. A shrub is different from a tree in this respect, having several shoots and continually sendind up new ones. In growing Filberts several varieties should be planteg in order to secure good pollination.

So much for the best hardy varieties. For the South and Southwest, the English Walnut, the Japanese Walnut, and the Pecan are to be recommended. The English or Persian Walnut was much used by the Arabs, who served the kernels with dates or oranges. It was introduced into Italy from Persia through Greece at the beginning of the Christian Era. The Romans cultivated the trees in orchards as we do Peaches and called the nuts Jupiter's acorns. This species is grown in America, chiefly in California. Unfortunately, a serious bacterial blight of the green fruits has appeared in the East, and its cultivation there must be restricted until immune varieties have been developed. Heart nuts, from Japan, come into bearing early. The trees are attractive, rather small in stature, and seem to do well in the milder regions of the South.

The Pecan, however, is by far the best nut bearing tree for the Southern States. It has the form and general sturdiness of the other Hickories, with nuts that cannot be excelled. A neighbor of mine in Florida has a dozen trees about her house.

The Pecan is not productive north of New Jersey. The real Pecan region lies in the Mississippi Valley below St. Louis and in the South Atlantic and Gulf States. Grafted trees bear in from three to eight years. There are several very fine varieties now on the market, some bred for resistance and others for size and quality of nuts. I have paid as much as 80c. a pound for the best Pecans, in Florida my friends with trees in their yards give me all I can use.

Let us, therefore, find room for a few nut trees on our suburban lot. They will give us little trouble, come into bearing fairly early, supply shade, be attractive throughout the season, resist storms, and live to a good old age. The nuts may be eaten, given away or sold—if not stolen. If the trees become too crowded, they make excellent firewood.

Take your choice. If you live in the North, you may have the Black Walnut, the Shagbark Hickory, the hybrid Chestnut, and the European Filbert; in the South, the Persian Walnut, the Japanese Heart nut, and the Pecan. Not only the locality but also the space and the character of the soil must be considered in making a selection.

Chapter XVIII

CIVILIZED TREES

Under the title of "Are Some Trees Civilized?" Don Knowlton published an article in the *Atlantic Monthly* which will interest many persons who live in large cities. Let me give a few scattered quotations from this article:

Once Cleveland was known as the Forest City. Its great Elms and Maples helped to make Euclid avenue one of the show streets of the world. There were, too, Oak and Ash and Whitewood and Beech, and many others, some of them relics of the old forest. . . .

Then came industrialism and expansion.

Real estate men, opening new subdivisions, sought trees that would grow rapidly. They hit first upon the Lombardy Poplar . . . but its roots pried open so many drains and water pipes that they had to be taken out finally, roots and all.

In the meanwhile the next crop of allotment adventurers had discovered the Carolina Poplar, a compromise between the Cottonwood —whose branches grow horizontally—and the Lombardy. . . . In spite of the fact that it, too, has a propensity toward sewer exploration, the Carolina Poplar has remained.

That stage passed; and nurserymen allotment owners, and the city forestry department began to plant Elms and Maples and Oaks, with an eye toward permanent beautification. But in the meantime industrialism boomed, smoke and gases poured into Cleveland's air, and the problem became not one of planting new trees, but of saving old ones.

The Oaks died outright. So did the Sugar Maples and most of the Elms. The Soft Maples lingered along, dying not so much from the smoke itself as from various parasites, which took advantage of their weakened condition. . . . .

Failing in conservation, in spite of spraying and trimming, forestry men and landscape gardeners sought to find trees that would grow in the smoke and gas. The first successful experiment, perhaps, was with the Catalpa. . . . The European Sycamore also proved an exceptionally good smoke grower. . . . But with European Sycamore and Catalpa the venture of the planters stopped. Foresters at last practically gave up conservation of the old trees in the downtown

section, and transferred their attention to outlying parks and streets where Pink Oaks, Norway Maples and Elms would thrive.

And then, downtown, began an amazing natural reforestation.

Whoever first brought the Ailanthus to Cleveland I do not know . . . but it adopted downtown Cleveland. It spread by self-seeding, and with incredible rapidity. The thicker the tenements and the population, the thicker the Ailanthus. Where smoke and dust and grime and gases seem most vile, there the Ailanthus flourishes prodigiously. . . .

So today a survey of the healthy trees in the smoke-covered areas of Cleveland reveals the following:

European Sycamores on the Public Square and along certain residential avenues.

Catalpas on the Public Square and in scattered localities.

Ailanthus throughout the entire district of the downtown, poorer-class, crowded homes.

Carolina Poplars along downtown streets that are still residential.

Weeping Willows in the steel district.

Crack Willows along the refuse drains of the industrial ravines.

White Poplars along the slag and cinder banks.

Pear and Ginkgo still flourishing here and there upon the remains of old downtown estates.

I do not mean the other trees, such as Elm, Maple and Whitewood, may not be found in smokier Cleveland . . . but with the exception of isolate cases in which care has preserved them, they are dying, and dying rapidly. . . .

Now to the point which leads to speculation. *Not a single one of the trees on the above list is native.*

From this point Mr. Knowlton proceeds to trace the course of some of the trees mentioned—especially the Ailanthus—from their native lands (where, clearly enough, they have never had to contend with such conditions as are brought about by modern American industrialism), to their present localities in such a community as Cleveland. Why, he asks, with its prodigious powers of reproduction and growth, does it (the Ailanthus) not emigrate to the country, and crowd out our native trees?—where, as he observes, it does *not* flourish.

Perhaps, he continues, it is not merely because the Ailanthus can successfully combat the smoke and gases that it has reforested Cleveland. . . . It is far more pleasant to conceive that the Ailanthus, like man, has adapted its physical mechanism to the exigencies of industrialism. If civilized man can live in an atmosphere of soot and cinders, should not also a civilized tree? . . .

Here is, indeed, interesting speculation.

Chapter XIX

TRANSPLANTING

Time to Transplant. It is not a simple matter to say when trees should be transplanted. Due to the multitude of kinds of trees and the various climatic conditions that prevail in various parts of the United States, we must follow the advice of our nurserymen, or else we can arrive at our own conclusions after considering the factors involved.

Advantages of Fall Transplanting

In general, we may say that Fall is the best season to transplant for the following reasons:

1. The soil is warm and easily worked. Plenty of moisture is available, but the soil is not as soggy as in the Spring.

2. Long season of planting. In some sections Spring comes with a rush; Autumn lingers into Winter. Transplant after the leaves have had a hard frost and the growth has been checked or made dormant. One often waits for some weeks in Spring for a good transplanting day.

3. Nurseries are very busy in Spring. They must fill their orders in rotation. Sometimes you are ready for your stock earlier than they can dig it; sometimes they ship it too early so that it lies about and dries out. Trees in full leaf of early Spring are not ideal for planting.

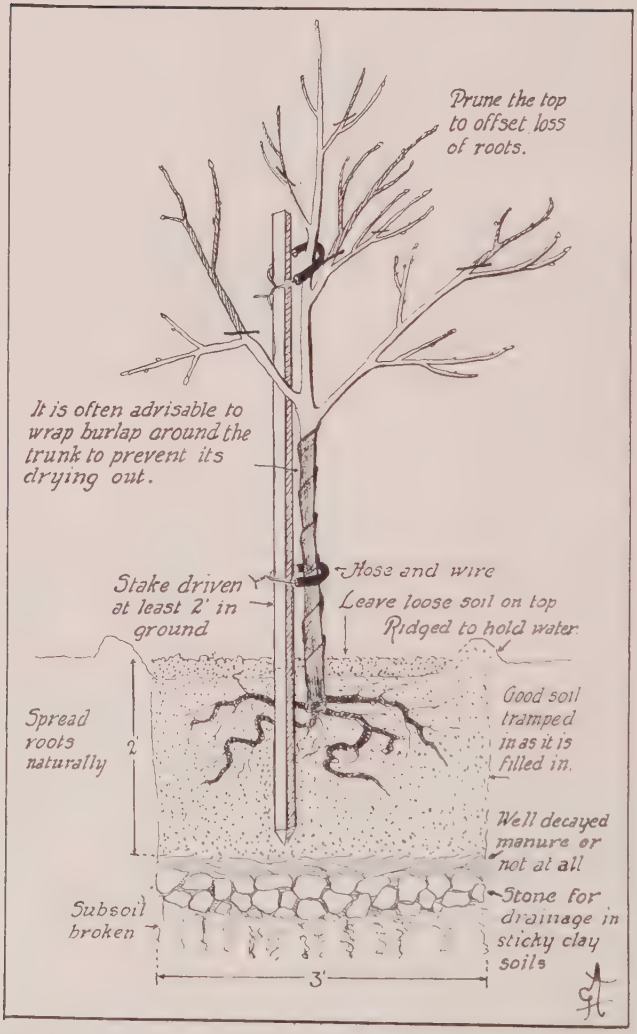
4. Rare plants are always sold out by Springtime. The nurseries are always short of certain items in Spring. It is disappointing to be forced to leave vacancies in our plantings. It is always a case of "first come, first served" with the best.

5. The trees are established and ready to grow when Spring arrives. The roots having grown some in the warm soil of the Autumn will force the tops into immediate growth.

Disadvantages of Fall Planting

1. Alternate freezing and thawing in heavy, lifeless clays break roots and heave plants from soil unless mulched.

2. Winter winds loosen plants which are not fibrous rooted nor furnished with a number of stems coming from the soil.



Study this diagram because it tells the whole story of planting trees. It illustrates the Sixteen Commandments of transplanting success described on page 99

3. Too late transplanting, using frozen soil, results in clods which cause air spaces. When ground freezes hard, stop transplanting.

4. In some sections of the country the Winters are accompanied by drying winds, severe cold, and either too much or too little moisture.

Transplant in Spring

A general statement can be made that the thin bark trees, those with smooth bark, and all such as one doubts as to hardiness should not be transplanted in the North in the Fall. The list includes: Beech (*Fagus*), various; Birch (*Betula*), various; Dogwood (*Cornus*), various; Elm (*Ulmus*); Linden (*Tilia*); Maple, Red (*Acer rubrum*); Maple, Sugar (*Acer saccharum*). Other species are safe in the Fall. Magnolia, various; Poplar (*Populus*); Sweetgum (*Liquidambar*); Tuliptree (*Liriodendron*).

It is usually considered safe to transplant well matured trees, except those in the list above, in the Northern States, excluding those States with the most severe Winters. Trees are transplanted as soon as they go to rest in Alabama and Georgia. January is said to be an ideal month in Texas and Arkansas. Transplanting is not advised after March 15 in Oklahoma. In Kentucky late October and November are good, but the last week of February and early March are almost as favorable.

Relative to the difference between early and late Fall transplanting, it will be interesting to note that Dr. Whitten, of Missouri, found that late Fall transplanting has given better results than early Fall. Also that late Spring has given results equal to those of early Spring, providing that the trees have been kept perfectly dormant. Apple trees planted in the Fall usually begin root development about January after the surface soil has frozen. The rootlets start from the sides of the lower main roots. Early Fall transplanted trees began growth no earlier than the late planted trees. Root growth apparently goes on all Winter beneath the frost line. He adds that the early transplanted trees dry out more in the Fall and Winter than do these set later.

Successful Transplanting

Should you care to take every precaution to make a newly transplanted tree live, we suggest that you follow the following steps:

1. Mark out a circle in the sod twice as large as the tree roots.

2. Remove the sod for use on another part of your grounds.

3. Spread a canvas on the lawn to keep sod from being filled with soil.

4. Dig out the soil to a sufficient depth to provide the space for stone drainage. Remember, however, that in non-porous subsoils even the stone drainage may not be an advantage so that drain tiles may be needed to carry the excess water away. If the water cannot escape it may remain to fill the entire hole and thus exclude air.

5. Keep the good soil in a separate pile for it is too valuable to mix with the poor subsoil. It is also advisable to loosen the subsoil.

6. Use a layer of 3 or 4 in. of crushed rock if you think this advisable.

7. Then, perhaps, a layer of well decayed manure. Unless the spot is perfectly drained, this manure will be a positive detriment for it will cause the generation of carbon dioxide gas which will kill the roots.

8. Hold the tree in place and gradually place good soil about its roots, shaking the tree up and down to sift the soil between the fine roots. Set the tree only a few inches deeper than it grew in the nursery. Err in setting them too shallow rather than too deeply.

9. Tramp the soil about the roots as it is added. Use a heavy stick or the handle of the shovel to pack the soil.

10. When the hole is three-quarters full, apply water so that the soil is well washed into the air spaces.

11. Continue to add soil, leaving it loose on top.

12. It may be well to make a ridge around the base of the tree to retain the water for a few weeks.

13. Trim the tree back about half to two-third to offset the loss of roots necessitated in its digging.

14. Do not trim the leader in Oaks, and such trees as grow from leaders.

15. Wrap the trunk with the burlap as a preventive of sun scald, to avoid drying of the bark, and to prevent entrance of borers.

16. Stake the trees with a strong stake. Attach the tree with a wire run through a piece of garden hose to prevent chafing. A heavy rope may also be used.

Transplanting Evergreens

The reputable nurseryman who is familiar with evergreens attempts to induce the roots to become fibrous and remain in a limited small area. For this reason, most evergreens which we purchase from

nurseries have been transplanted from one to five or six times. Many of the sorts are inclined to produce roots which ramble through the soil widely, and it is necessary that the roots of young trees be pruned frequently.

The roots of most of the cultivated trees are sensitive to drying out, but in the deciduous trees, the drying out is merely the loss of a watery sap. With the evergreens, drying out of the roots is fatal. For this reason the nurseryman digs the evergreens with a ball of earth, which he wraps in burlap. Unless the nurseryman has transplanted his trees frequently, the ball which he ships with the roots is a snare and a delusion. The object of a ball is to hold the fibrous mass of roots. A Juniper which is not frequently transplanted has few fibrous roots, and when shipped with a ball would only add to the cost of the express without greatly benefiting the tree. When you purchase evergreens be sure that you get them from a reputable nurseryman who has prepared these trees for transplanting by previous root pruning and transplanting.

A ball-and-burlap evergreen has its roots protected against fatal drying

Nurserymen prune the roots of evergreens by using U-shaped cutting blades that are pulled through the soil by horses or by a tractor. Sometimes the roots are pruned every two years. Such nurserymen as are not equipped with this method of root pruning will actually lift the evergreens and transplant to a new spot.

Time to Transplant

The time to transplant evergreens varies in various parts of the United States, but as a general rule we may say that evergreens must never be transplanted when they are in active growth, which means that in most sections of the United States evergreens must

be transplanted very early in the Spring, before warm weather, or late in August. Due to the fact that many of the evergreens have splendid balls of soil, it is, however, possible to move them at rather unfavorable seasons, providing they are given splendid care, and a large enough ball is dug with the plant. However, Larches are extremely sensitive to being moved unless they are not in a perfectly dormant condition.

In most parts of the United States, Fall planting has decided advantages. According to A. H. Hill, "The season is longer. In the latitude of Chicago it begins about September 1 and continues until freezing weather, which comes about December 1 or earlier. In the Fall the ground is usually in a more workable condition."

In the Southern States, November, February or March are the best months for transplanting.

When an evergreen is transplanted, an adequate hole should be dug, and the tree, with its ball still wrapped in burlap, should be placed about the same depth as the tree grew in the nursery. The hole should have been dug deeply enough so that the new ball of soil rests upon a well prepared layer of loose soil below. After the tree is in place, some soil should be thrown into the hole around the ball. The burlap should be loosened from the top of the ball, and if the nurseryman has given a generous supply of burlap, this top fringe should be removed or tucked into the soil. The ball and the loose soil should be thoroughly watered when the soil is added, but when the process of planting is finished, none of the burlap should be protruding from the soil, as this acts as a siphon to remove the moisture from the soil.

After transplanting, the plants should be sprayed with water twice a day. This helps to check the rapid loss of moisture from the plants. It is not necessary to water the soil around the plants too frequently when they are first transplanted, but the spraying of the foliage is extremely important. Of course, if the ball of soil within the burlap has dried before planting, the gardener will use discretion in giving the tree sufficient water at the time of transplanting so that this ball may be thoroughly soaked.

Extensive notes on transplanting evergreens are found under Cedrus, page 363.

Chapter XX

CARE REQUIRED FOR TREES*

In order to grow and maintain healthy trees, they, like men, must have light, food, water and air. All green plants must have light in order to build plant tissue. Some trees require direct sunlight to live, others can live in partial shade.

In planting small trees in a partially shaded location, such as the north side of a building or beneath other trees, one should consider species, such as Maples, which can tolerate considerable shade. The Oaks and Elms are what we call intolerant trees; that is, they will not thrive in shade. Willows and Poplars are also trees which are best in a sunny location with plenty of space. Tolerant trees, such as Maples, Horsechestnut, Beech and Hemlock, may be planted closer than intolerant trees, such as Oaks, Elms, Pines, without having their lower branches killed.

Unfortunately, most home owners think that because trees in the woods have always grown without any help from man the ornamental trees about our residences should do the same. If it were possible for us to give our ornamental trees the same growing conditions that they have in the forest, they would of course grow as well. This we can rarely do. We usually attempt to have a lawn growing over the root area, and in doing so we are really growing two crops on the same soil and invariably carry off all that is produced in the way of leaves and grass clippings.

In the forest the leaves are dropped and form a loose, spongy mulch over the roots. These decayed leaves supply food for the tree. In maintaining trees upon our lawns and along our streets, therefore, we should provide them with food.

Trees and plants use a number of elements, but most of these are found in sufficient quantities in most soils. The writer's experience over a long period of years tends to show that the relative ratio of the value to tree growth is about four parts nitrogen, two parts phosphorus, and one part potassium. Of course, there can be no hard and fast ratio that would meet all conditions. Any good commercial fertilizer which supplies these elements will help, providing it is applied properly. Fertilizer is best applied at about the time the buds begin

* Charles F. Irish in *Better Homes and Gardens*, May, 1930.

to swell, about a quarter of a pound of good fertilizer for each one inch of diameter of the tree. This may be applied broadcast if the tree stands on bare soil, but if it is on a lawn, it would be better to punch holes 12 to 15 in. deep and put a handful of fertilizer in each hole. Fertilizer should not be placed close to the trunk of the tree, but out under the tips of the branches, forming a circle about it. On large trees several rings of holes may be necessary. The holes are usually spaced 24 to 30 in. apart.

Animal manures or organic fertilizers, if available, may be used alone or in connection with chemicals if appearances permit. However, they should not be buried more than a very few inches or they may do harm rather than good. If they are used it might be best to use them in the form of a mulch over the root area rather than bury them in the soil.

Before any food is available to a plant it must be in solution with water. Therefore, to have healthy growth we must have an abundance of water. Here, too, the trees planted about our homes are handicapped, for in the forest the soil surface is covered with a mulch of rotting leaves, which form a great sponge, soaking up the rains and holding them for use by the trees as required. This same mulch tends to prevent loss of moisture by evaporation.

By watering our trees at intervals we can supply them with sufficient moisture. It is best to water very thoroughly once or twice a week rather than to sprinkle every few hours. Frequently the soil becomes so hard that the water tends to run off. To avoid this it is best to water slowly for a long period, letting all the water soak in. Light watering usually produces shallow roots, which are more easily injured by drought and frost, whereas thorough watering tends to cause the roots of the tree to go deeper, where they are not so easily injured. Where possible, frequent cultivation over the roots will keep the soil surface loose, conserve moisture, and stimulate root action.

The fourth essential requirement of your trees is air. Probably very few of us appreciate that about 95 per cent of the material used in the structure of woody plants is taken from the air. This is accomplished by the aid of sunlight and the green-colored matter in the leaves whereby the carbon is taken from the carbon dioxide of the air and combined with the elements taken up by the roots to form sugars and starches. In the form of sugar, food is transported in the sap to the various parts of the tree and used at once in cell formation or stored for future use. This process is called assimilation, and as the carbon is assimilated the oxygen is liberated and is available as such to man, animals, or plant.

Trees breathe, and from the tip of the roots to the tip of the leaves the respiratory process is continually going on. In this process oxygen is absorbed and carbon dioxide thrown off. Just as human beings and animals require oxygen for respiration, so do plants. In and about our large industrial centers the fumes frequently poison the foliage and the soot clogs the breathing pores, thereby limiting plant activity and producing a sickly tree. Under such conditions it is difficult to do much. Frequent spraying of the foliage with water during the evening through the Summer months will be of considerable help.

We should not forget that the plant breathes in the roots as well as in the leaves. Therefore, the roots require oxygen as well as the leaves and upper parts of the trees. When our soil becomes packed by tramping, rolling of lawns, or similar operations, there is very little chance for the roots to obtain sufficient oxygen, and the carbon dioxide which is thrown off by the plant roots and soil bacteria accumulates, producing a condition toxic to the plants and retarding root growth. Here again we take a lesson from Nature. In the forest the litter of leaves keeps the surface loose and porous, the oxygen can readily find its way into the soil, and the carbon dioxide is easily diffused. When the farmer cultivates his crop he establishes a similar condition. We shall aid our trees if we can establish a porous surface above the roots —either by mulch, cultivation, or by the more recently developed practice of loosening the ground by liberating compressed air at 15 to 18 in. below the surface and aerating the soil about the roots.

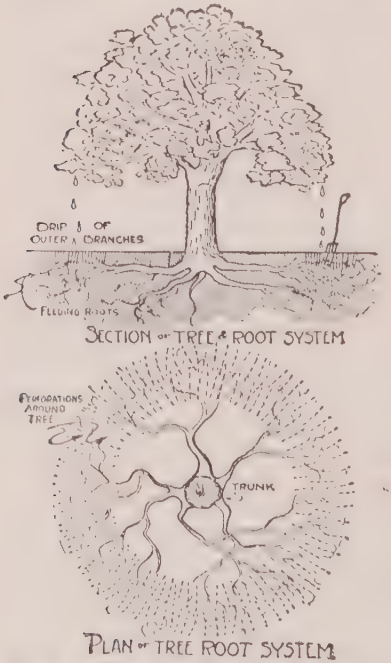
Changed grades may cause suffocation of the roots. This condition should be corrected by drainage as well as by supplying ways by which air can reach the roots. In fact, in all heavy soils drainage should be the first step and is just as essential to trees and plants under artificial conditions as a foundation is for the house. Where grades are to be changed a drain 18 to 24 in. below the original surface should be constructed, then a layer of several inches of gravel or crushed stone should be made over the root area, with a large well built about the trunk of the tree.

Having taken care of the essentials of plant growth, we have done much to make our trees immune to parasites, as healthy trees are less likely to be attacked and are better able to overcome the injury, while a sickly tree is susceptible to all manner of parasites. These may come in the form of insects, fungi or bacterial diseases.

Chapter XXI

FEEDING TREES

Many of our trees growing in the home grounds can be encouraged to make more rapid growth than those in the forest because it is possible for us to give them better soil and more food. However, some of these trees are so located that they are starved for food and receive only meager supplies of water.



If we realize that the feeding roots of a tree extend as far out as the branches spread, we will apply the food where it is taken up most readily

When we consider that a large tree gives off a tremendous amount of water each day we know that we can only supply it with a small portion of the amount which it uses. Often a tree with a 50 ft. spread will throw off, by transpiration, 30 barrels of water a day. Therefore, it is wise for us to prepare our soil in such a way that the tree may receive the maximum amount of water, for only when plant food is in solution can the tree use it.

The Essential Elements

Some years ago, before we understood plant life as well as we seem to think we do now, the matter of feeding plants was simpler. We realized that plants are most in need of three elements: nitrogen, phosphorus, and potash, and then besides these we considered that there were perhaps six or

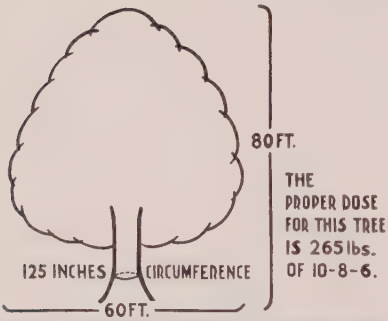
eight other elements which went into the make-up of our plants and were therefore essential for their well-being. However, we reconciled ourselves to the fact that most of these minor elements were found in sufficient quantities to satisfy our plant's needs. Recently, however, we have come to the conclusion that there are so many different kinds of trees coming from such a great variety of climates and soils that we are just on the hem of a new understanding of essential tree needs. We have come to the conclusion, therefore, that our trees need not only nitrogen, phosphorus, potash, sulphur, hydrogen, iron, magnesium and calcium but also a number of other elements such as boron and perhaps various vitamins, especially vitamin B_1 and perhaps B_6.

The plant food manufacturers are now making up a great share of their commercial plant foods to include the essential elements for the growth of our plants. Such complete plant foods are like a *table d'hote* dinner as compared with an *a la carte* meal. In other words, without understanding the chemistry of feeding, we can supply the plants with all of the elements which the experts have considered to be advisable. We can proceed then on the assumption that the soil needs all of the elements and those which are not used will be present in reserve but are generally not poisonous to the plant. Far the greatest share of the bulk of the tree is derived from the air rather than from the soil or water. From the air a plant takes carbon, oxygen, and hydrogen and manufactures its starches and sugars.

How Much Food Is Needed

Dr. August Beilman of the Missouri Botanical Garden calculates the amount of food required for each tree by adding together the height in feet, the spread of the branches in feet, and the circumference of the trunk in inches; the sum of these three figures being the number of pounds of complete plant food needed for a badly run-down tree. Those in a better condition can receive proportionally less. Such a feeding is good for a period of four or five years. The formula of Ohio State University is: 5 pounds of 10–6–4 complete plant food for each inch of trunk diameter.

Various tree specialists have devised methods of forcing the food into the soil by the use of pneumatic drills, but the home owner can easily use other methods. A crowbar may be driven into the soil to a depth of 18 in. and then the plant food used to fill these holes. Such holes should be placed evenly around the tree about as far out as the spread of the branches. After the plant food is applied the tree should be watered abundantly because most literature emphasizes the fact that water does not move laterally to any great extent. This



How fertilizer dosage is calculated: To the height in feet (80), add the branch spread in feet (60) and the trunk circumference in inches (125). The sum is the amount of 10-8-6 fertilizer needed.
—Missouri Botanical Garden.

necessitates making the holes as close together as 18 in.

Homer L. Jacobs, in a long series of experiments, used all manner of organic materials to promote the growth of newly transplanted trees. When the soil is open and friable the new roots enter it freely in their search for food and moisture. His results are approximately as follows: The roots of trees planted in clay and peatmoss grew much more rapidly than those in subsoil alone or in good topsoil without peatmoss. At the end of the season the trunk measurements showed 56 per cent better trunk growth in trees planted in peat treated soil as compared with those in good topsoil. During the second season the benefits continued, making 35 per cent better root development. In other tests American Elms in a peat-soil mixture benefited over untreated trees from 35 per cent to almost 65 per cent during a period of three years. Of course, peatmoss contains no plant food and the use of it does not eliminate the necessity for feeding.

General Hints

If the soil under your trees is beaten down by constant traffic it should be loosened frequently so as to allow air to enter the soil for some trees are almost asphyxiated.

Sometimes a leaky gas main is near the trees and will cause them to appear to be starved or even to die.

If your leaves are undersized, yellowish, or brown, if the foliage is thin or sparse, if the tips of the branches are dying back, if the tree is full of dead branches, and there is an annual twig growth, you know that your trees need feeding.

Starved trees are much more susceptible to diseases and insects, particularly borers.

All plant food should be applied to trees earlier than March and not later than August. The seasonal growth of most trees is practically completed by August and most of the high-test plant food which we might use is highly soluble, therefore that would be almost completely exhausted before the tree could make use of the food.

Do not confuse watering your lawn with watering your trees. Sprinkling the lawn for a brief period in the evening will not be sufficient for the needs of the tree. A hose should be allowed to run for several hours in order to adequately supply the tree roots with moisture; otherwise by shallow watering we will only coax the tree roots to the surface which is being robbed of its food and moisture by the lawn.

In natural forests the soil is being constantly enriched with decaying vegetation—the leaf mold. The absence of grass allows the water to trickle down through porous earth, thereby carrying dissolved plant food to the hungry feeding roots.

But city trees must struggle against killing conditions. They are living in an artificial world where the supply of plant food is steadily supped, but never replenished. Fallen leaves are raked up and carted away or burned. Thick sod robs the tree of food, prevents water from penetrating the soil, and excludes air.

How Trees Ask for Food. When the original plant food in the ground is used up your trees begin to show warning signs of low vitality. These symptoms may be listed as follows:

1. Leaves undersized.
2. Leaves yellowish.
3. Leaves brown.
4. Foliage thin or sparse.
5. Tips of branches dying back.
6. Tree full of dead branches.
7. Buds undersized.
8. Short annual twig growth.

See also page 110.

When you feed your trees you are making an investment in shade. And shade is health and happiness and relief from the scorching sun.

THEODORE ROOSEVELT said: "A people without children would face a hopeless future; a country without trees is almost as hopeless; forests which are so used that they cannot renew themselves will soon vanish and with them all their benefits. When you help to preserve our forests or to plant new ones you are acting the part of a good citizen."

What's Wrong with My Tree Food*

Symptoms	*Causes*
1. Poor leaf growth which causes	
a. Dwarf plants, yellowish color	lack of nitrogen
Dwarf plants, greyish color	lack of phosphorus or potash
b. Tall, spindly plants	lack of light
2. Chlorosis or yellowing of leaf	
a. Uniform all over leaf	lack of iron, excess of lime, magnesium, sodium, potash, carbonates, manganese
b. Patchy, spreading from the midrib outward	lack of magnesium
c. Mottled	lack of lime
d. Spotty	lack of potash
e. Leaf yellowing, then dying at the tip and from edges inward	lack of potash
f. Leaf yellowing then dying from midrib outward	lack of nitrogen
3. Patches on leaf	
a. Brown patches like "scorching"	lack of potash
b. Brown patches chiefly in the center	lack of magnesium
4. Rich green leaves and large thick stems	large supply of nitrogen
5. Dark colored leaves, tendency to crinkle	lack of potash in relation to nitrogen
6. Patchy appearance of foliage, some dark green others lighter	acidity of soil

* Credited to Sir John Russell in an article on "Soil Conditions and Plant Growth" in *Tree Talk.*

WILLIAM BARTRAM tells us that the Creek Indians in his day pounded the Shellbark nuts, cast them into boiling water and then passed the mass through a very fine strainer. The thicker, oily part of the liquid thus preserved was rich like fresh cream, and was called by a name signifying "hickory milk." It formed an ingredient in much of their cookery, especially in hominy and corn cakes. CHARLES FRANCIS SAUNDERS.

Chapter XXII

PRUNING

If we look at the trees in the forests we see that they have the ability to prune themselves. The lower branches become shaded and soon they are ready to drop from the tree. As Charles Irish expresses it:

In Nature, more top is produced than the roots can continue to support in vigorous growth, with the result that the plant is constantly pruning itself. This pruning may take the form of premature shedding of leaves, and frequently happens when a plant finds itself unable to supply water and food in sufficient quantity. This is quite noticeable on Norway Maples during the warm, dry spell in middle of Summer. In other words, Nature has equipped itself with ways and means of meeting a depression.

In some cases Elms have been observed to shed not only foliage, but many of the smaller twigs. The fact that plants produce more buds, leaves and branches than the roots can support, creates competition among the leaves, buds and branches for sufficient food and sunlight to enable them to live. This competition results in the loss of foliage, the failure of four out of five buds to grow, and in the premature death of the overshadowed branches. Each tree carries the recording scars of the battle for existence, both between its component branches as well as between it and the adjoining trees. This, as well as the amount of rainfall, is recorded in the annual rings.

All this by way of showing that pruning is not an unnatural practice, but is carried out by the plants themselves. However, the results obtained by natural pruning are limited.

Why We Prune Trees

1. We prune first to shape the young tree. With an ideal form in mind we remove all such branches as are not properly placed to make a well balanced top. We know how simple it is to remove the small branches and divert the growth in a new direction. When we neglect to prune a tree, waiting until the branches are large, it is quite impossible to change its form.

Unless there are a number of branches on the trunk of a young tree, the tree becomes top heavy. Therefore, do not induce a street

tree to attain a height of 10 ft. before it is allowed to branch, but retain some branches lower down for the purpose of building the trunk.

2. We prune trees to make them grow in a way that shall best serve our purpose. A tree may be encouraged to spread widely by removing its leader; grow more upright by pruning its side branches; grow more open in the center by removing some of the branches back to the interior of the tree; grow more compact by trimming the tips of all branches; and we can produce symmetry by curbing the growth of such branches as depart from the formal habit. Nevertheless, it is a law of nature that trees tend to resume their natural form.

For each tree we may have a different ideal. For the Elm we shall strive to make it vase shaped, for the Pin Oak, the Spruces and many conifers, we shall not remove its leader for in so doing we are destroying its symmetrical pyramidal form. We grow the Hawthorn because of its horizontal branching; let all pruning be done to emphasize this desired characteristic. Certain trees are beautiful when they are less regular so that we prune each tree according to our ideal.

3. We prune trees to prolong their lives. Old trees will need old and decayed branches removed. Decay in a tree is seldom cured but spreads when it once starts so that it is possible to, at least, arrest its development by pruning such branches as are spreading the disease.

Soft Maples and other trees with brittle branches should be pruned in a way that shall avoid injury by excess weight of winter ice.

4. We remove branches which have been neglected. Sometimes a crotch is formed which will cause the tree to split. Water sprouts, or suckers, may arise throughout the whole tree as the result of excessive pruning. Such strong shoots often grow at the expense of the desired branches. Such water sprouts also spoil the form of the tree.

5. We prune at planting to offset the loss of roots. Detailed directions are impossible to give, but it will be wise to cut back all branches at least three-fourths. Remember to retain the desirable branches which help to form a well balanced top.

Broken roots should always be cut back to a fresh, healthy surface. Excessively long roots may be pruned to facilitate transplanting, but it is well to bear in mind that a good root system is necessary. Prune roots as little as possible.

6. We prune street trees in order to facilitate the traffic of vehicles and man. They should be gradually induced to branch high in order to produce an arching effect over the street. Thus we prune to open vistas down the entire length of a street for a uniformity in effect.

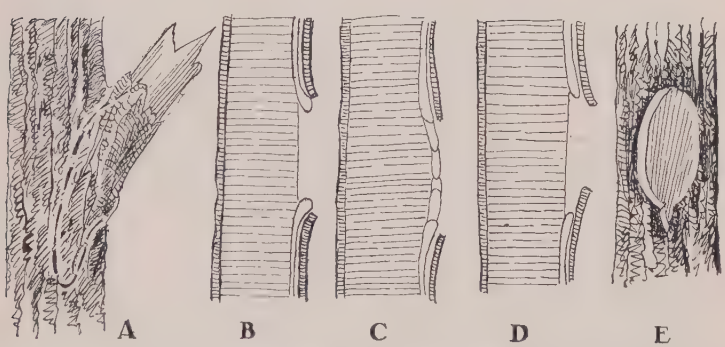
7. We prune fruit trees in order to obtain higher quality and more abundant fruits which are produced in easy reach of the picker.

Who Should Prune Trees?

If you can prune your own trees you will be able to do so with greater understanding of the results you desire to obtain from them. If you have a shade tree you will know best whether it should be allowed to grow to the right or the left to give you the shade or the setting for your house. Be cautious of the man who says that he "knows all about trees." He may ruin the growth of a half century. He may so butcher your tree that its gracefulness is entirely destroyed. In each city you will find nurserymen, tree surgeons and other trained men who will do your work if you cannot do it yourself. We are greatly in need of licensed tree workers for there are many men who know nothing about the growth of a tree and who dehorn trees to their everlasting ruin.

Sheba Hargreaves once wrote:

There is a simple philosophy of tree pruning which underlies the technique—art of any sort is just the application of the principles of philosophy. There must be a good reason for every cut, so it is best to study the little tree very carefully before cutting. The rules may vary slightly with different varieties of trees, but the fundamentals are always the same. Looking at a young tree ready for setting, it seems impossible that such a slender switch will ever be a big tree, and it looks like cruelty to cut it all to pieces, but a trip through any section of the country will show trees in door yards that have



RESULTS OF PRUNING

A, long stubs when left in pruning die back. The decay spreads into the main trunk of the tree as indicated by the dotted line. B and C, shows the progressive healing of a wound due to the growth of the cambium which produces a layer of bark to cover the exposed area. D, depicts a slow development of the bark repair. The outer bark should be pared away because it will catch and retain much moisture. E, a slight groove at the base allows this wound to drain off the excess moisture

suffered all their long lives from the mistaken kindness of sparing the knife in their early days.

When to Prune

For many years there has been an old and cleverly stated rule that we should prune "whenever the knife is sharp," but we are coming to believe, as the results of experiments, that this rule, though cleverly stated, is not perfectly true.

Careful measurements of wounds as the result of pruning at various dates have been made and the length of time required for healing has been studied by Dr. Rush P. Marshall.* His results are summed up as follows:

The results of the experiment indicate that callus development of wounds made between February 15 and May 15 was, in the case of the five species of trees,† better both in the shape that it assumed and in the area that it covered, than was that of wounds made at any other period. It is then probable that pruning and cavity work that can be conducted in the Spring of the year will have advantage in callus production over similar work performed during the Summer, Fall, or Winter.

On the other hand, it may not always be practicable to perform a major part of the pruning during the Spring season. Weather conditions are not especially favorable for pruning during February; in March high winds frequently increase the difficulty of operating on tall trees; while during April and May the task of spraying frequently causes any but the most pressing duties to be set aside. But even in this event the advantageous effect of Spring wounding should prove to be of much value in dealing with (1) tree species that have delicate bark or that tend to form but little callus growth, (2) the individual that is lacking in vigor, and (3) the particularly valuable tree.

Possibly a principal application of this seasonal effect is to the treatment of such fungous diseases as affect twigs and small branches. While the life histories of the particular forms for which control is sought is highly important, it is to be remembered that some fungi tend to fruit very early in the season.

Theoretically, thorough pruning in February would therefore seem to be advantageous from a number of angles:

(1) It should remove the diseased parts before the fruiting of the fungus and so lessen the spread of infection.

(2) Pruning at this season would permit the use of reasonably strong fungicides as dormant sprays immediately following the removal of the diseased wood.

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* The relation of season of wounding and shellacking to callus formation in tree wounds. —U. S. D. A. Technical Bulletin 246.

† The species studied were: Red Maple (*Acer rubrum*), Tuliptree (*Liriodendron*), White Oak (*Quercus alba*), Red Oak (*Q. borealis maxima*), Black Oak (*Q. velutina*), and the Chestnut Oak (*Q. montana*).

(3) It is impossible to apply wound dressing to the numerous small cuts resulting from twig pruning, and yet the same spray which affords temporary protection against the infection of other parts must also afford temporary protection to such cuts. This is a point which the orchardist has long recognized but which the commercial tree expert has often overlooked.

(4) Such a season of pruning would be in accord with the favorable season of wounding from the standpoint of callus formation and with the time most favorable to rapid blocking of the wood vessels with wound gum and the consequent formation of a barrier against infection through the cut surface ultimately left exposed by the weathering of the protecting cover of spray material.

It is recommended, where practicable, that all cut surfaces of the cambium be given an immediate application of some protective dressing that is known to be noninjurious to this tissue. If shellac or any similar product is used for this purpose, it is not to be interpreted from the present investigation as of value for the protection or preservation of the wound itself against weather, insect or decay. This substance has been tested merely for its effect on the growth of the callus. (See page 119 for discussion of treating tree wounds.)

Vigor is a prime factor in healing. When a tree is to receive cavity work or considerable pruning, particularly that which involves the removal of large branches, its general vigor should be carefully considered. If it is in a condition of low vigor, the rectification of any known unfavorable condition may be of great advantage in aiding the rapid healing of the cuts. Such unfavorable conditions may arise from numerous causes, common among which are lack of sufficient soil moisture at some time during the year, insufficient drainage, the exhaustion of the available forms of certain chemical elements in the soil which are important to plant growth, improper mechanical condition of the soil, lack of soil aeration, the presence of toxic substance in the soil or air, and the presence of fungus or insect pests.

The result of Winter pruning is to stimulate growth whereas Summer pruning checks growth.

How to Prune

1. Cut each branch as close to the crotch as possible.

2. Make the cut parallel to the trunk because such wounds heal more quickly. When a long stub is left there is no method of inducing the sap to flow toward the wound to heal it. Such long stubs soon decay, with the result that the decay spreads into the larger branches and the trunk.

3. Some few trees survive drastic heading back but this must be considered tree butchery not surgery. Perhaps we are justified in taking out the top of an exceedingly tall Carolina Poplar, but few other trees

Method of cutting large branch to avoid splitting. The line at A represents the final cut; the line at B represents the first cut.—(Courtesy of Cornell Agr. Experiment Station)

are as worthless as to deserve such harsh treatment from the hands of the pruner.

There are cases of old trees whose tops have become badly neglected, diseased or broken. As a last resort, such trees can be headed back in the hope of prolonging their lives.

4. Avoid tearing and destroying the bark when large branches are removed. Make a temporary cut about a foot away from the final cut. This will help to avoid the skinning of the bark when the final cut is made. Make the temporary cut as deeply as possible, continuing until the saw binds.

5. In neglected trees do not attempt to bring them into shape in one year. Prune out some of the old branches one year and wait until the next year to complete the desired transformation.

In cutting back trees severely at the top, attempt to prune back to a branch, even though it be a small one. Cut such large branches at such an angle that water is shed rather than encouraged to accumulate.

6. In *The Gardeners' Chronicle of America*, J. H. Nicolas writes:

It behooves to watch for gormand branches, which grow more rapidly than the others, thus famishing them by an excessive consumption of sap. When detected early, such branches should be removed close to the trunk, if such a removal does not affect the regularity of the tree. When such branches cannot be removed, which is seldom the case, the flow of sap can be checked and diverted to the rest of the tree, restoring the balance in a year or two. With the pruning saw, an incision about one-quarter inch deep is made around the underside of the branch, close to the trunk, and of the length of about two-thirds of the circumference. If the branch is still young, another method is to make a notch on the trunk under the branch, of the width of the branch, at the same time making a similar notch above the opposite branch, which it is desired to encourage. A notch under a branch checks the flow of sap and one above a branch pushes the sap into that branch.

Results of Pruning

W. H. Chandler in "*Results of Some Experiments in Pruning Fruit Trees*," Bulletin 415 of the Cornell Univ. Agr. Exp. Sta., reports experiments with fruit which also apply to ornamental trees. Some of his conclusions are:

1. Pruning away a part of a tree seems to cause more vigorous growth of the part remaining, the increase in vigor being greatest near the point where the cut has been made.

2. This increased vigor seems to result from the fact that the tree is left smaller, while the root system, which must supply water and mineral nutrients, is temporarily as large as if no pruning had been done.

3. The resistance to water movement in the tree may also be reduced temporarily by the pruning, but there is little knowledge as to how much effect this resistance has on the supply of water reaching the growing points.

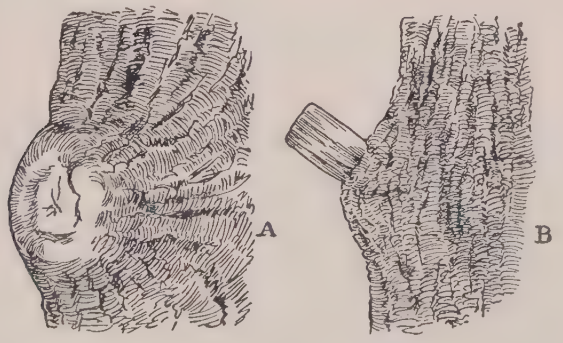
4. In spite of the apparent increase in vigor, pruning a young tree is a dwarfing process. The tree is nearly always reduced in size by more than the amount of wood cut away in pruning. This is because pruning reduces the leaf surface, and therefore the possible production of materials necessary for growth.

5. The efficiency of the leaves in producing material for growth may also be reduced.

6. Root growth is generally reduced strikingly by pruning.

7. The invigorating effect of pruning, then, is temporary, lasting only until by reduction in growth the root system comes to be no larger in proportion to the top than it was before the pruning.

8. Pruning reduces the amount of fruit borne by trees that have not reached maximum bearing size.



Results of correct and incorrect pruning. A, correct method, after two years; B, incorrect method—(From a U. S. D. A. Farmer's Bulletin)

9. With some trees that fruit terminally on spurs, such as the Apple and the Pear, the reduction in fruiting is greater than the reduction in growth.

The foregoing conclusions are from experiments in New York. The results of these are in agreement with results obtained under a number of different climatic conditions. It is not improbable, however, that a combination of soil, climatic and cultural conditions might be found in which pruning, especially cutting back, would not dwarf the young tree nor delay fruiting.

10. Fruiting dwarfs the tree to a greater extent than does moderate pruning, and therefore after a few years of fruiting unpruned trees may be no larger than trees receiving a moderate amount of pruning. However, they will be larger than trees that have had much pruning, particularly much thinning out of the top.

11. Where the growing seasons are short, any large amount of pruning reduces the resistance of trees to low temperature in the Winter following.

12. Early Summer pruning delays maturity, and late Summer pruning reduces the leaf surface late in the season when it is needed to ripen the wood; so pruning at either season should reduce resistance to low temperature more than would equally severe dormant pruning.

13. The removal of large branches, or rather severe cutting back of branches in late Autumn or in Winter seems slightly to reduce the ability of the tree to withstand very low temperature.

14. When only a very small amount of wood is removed, as in cutting out small crossing or interfering branches, the work may safely be done at any season of the year.

15. The pruning necessary to train a young tree to any form different from that which is natural to it dwarfs it and delays its fruiting.

16. With most varieties of fruit, if the removal of desirable branches moderately low on the trunk or main branches, and the thinning out of branches to let in the light are delayed until the trees are old enough to fruit heavily, more growth and larger yields while the trees are young will be secured.

Tools for Pruning

For large limbs a good saw is necessary. The teeth should be so filed that the saw cuts when drawn toward the pruner, because in the uncomfortable positions required, it is easier to pull than to push the saw. Some saws are made curved. A curved saw works more freely above the head.

One of the best saws resembles a meat saw. The blade is narrow and may be turned in any direction, thus making it possible to get into narrow spaces without injuring the nearby branches.

For smaller branches which can be easily reached, pruning shears and lopping shears are used. For those branches which are high up or

This is the most convenient saw for tree pruning when the worker can get near the branch

at the ends of inaccessible branches, a shear has been devised which is on the end of a long pole. Saws are always better than shears as they cut cleanly without crushing the branches. Of course, any long-distance pruning, such as can be done by these shears on poles, does not accomplish a neat job because it is impossible to prune without leaving stubs.

Dressing for Tree Wounds

Small tree wounds heal quickly but those 2 in. or more in diameter should be covered with a durable wound dressing. Listed in order of their merit are: asphaltum, orange shellac, white and red lead paint and bordeaux paste. One of these should be applied immediately as soon as the cut has been smoothed with a plane or knife. Such trees as Maples or Birches bleed profusely in the Spring and should only be pruned later or in Summer when the wood remains dry enough to paint.

Asphaltum commercial paints are the best as they are thin enough, without heating, to apply in cold weather. Thick asphaltum paints blister and are hard to use. Moisture from below often causes these blisters to break and cause a source of infection by the opening they leave in the covering.

Orange shellac is the least harmful to the cambium and can be

applied in cold weather. On large wounds it tends to crack so that it is wise to retouch several times a year.

White and red lead paints are objectionable in color and slightly injurious to the cambium.

Bordeaux paste is made by mixing commercial bordeaux mixture with enough linseed oil to form a paste. As a wound dressing it is slightly porous to moisture and air and is also a fungicide. The color is an objection as it changes from blue to green after it has been applied. The colors come through any paint which can be applied to it.

Dead Trees Should be Removed

When a tree dies it soon becomes untidy and eventually a danger. Do not cut if off near the soil with a resulting stump which is sure to provoke you. Remove the soil 2 ft. or 3 ft. from the stump and down to 2 ft. or 3 ft. The large roots can then be cut and soon the trunk can be made to fall by its own weight. A rope attached to its top will assist in getting the tree to fall in the desired direction. Of course, with the largest trees a block and tackle, or a team or tractor may be necessary.

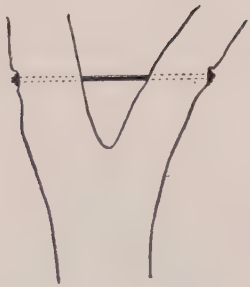
Gardening Illustrated (England) tells how to remove tree stumps:

In the Autumn bore a hole 1 in. or 2 in. in diameter and 18 in. deep, put in 1½ oz. of saltpetre, fill with water and plug up close. In the following Spring put into the same hole one gill of kerosene and then light. The stump will smoulder away without blazing, leaving nothing but ashes. The best and the cheapest way in the end is to grub the tree stumps.

Supporting Branches

The future beauty of many trees is greatly endangered by the fact that the branches are not properly supported, due to improper pruning, or as a result of omitting to prune the branches before they form great crotches in the tree, which are sure to result in splitting when the trees are subjected to the heavy winds or the weight of a thick coating of Winter ice.

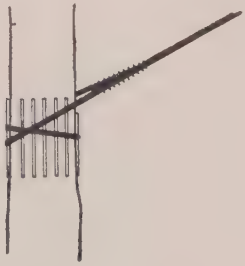
STEVENSON referred to trees as "citizens" of the forest. He declared that "trees are the most civil society." "There is nothing so much alive, and yet so quiet, as a woodland," he says; "and a pair of people, swinging past in canoes, feel very small and bustling by comparison." Thoreau, whom John Burroughs calls "a wood genius," declares in his "Walden" that, in his rambles for knowledge, "instead of calling on some scholar, I paid many a visit to particular trees."



Improper treatment to prevent splitting **Proper treatment**
(From City Tree Planting by T. Glenn Phillips, Detroit City Planner)

The best method of supporting trees is to bore a hole in a limb and run a bolt through it, with the nut of the bolt placed so that the bark may grow over this end of the bolt. Chains can then be stretched between two similar bolts placed in the limbs. If the cabling is done near the base of the limb, the bolts may be long enough to reach from one limb to another, or a solid rod may be hooked to the two bolts. But if the cabling is necessarily at a distance from the base, chains are advisable because they allow for the proper play of the branches in the wind. Also see the box on page 90.

It is a bad practice to wire the branches of trees together by wrapping the wire entirely around the branch. Several years after this method of support is practiced, it will be seen that the branches die due to the girdling which naturally takes place in time.



Improper method of attaching guy wires **Proper method**
(From City Tree Planting by T. Glenn Phillips, Detroit City Planner)

Pruning Evergreens

Although we do not prune evergreens in the same way that we prune deciduous tree, inasmuch as we seldom cut back branches unless they are dead or spoil the symmetry of the tree, evergreens need some pruning in order that they may retain their natural habit, grow to suit our desires, or keep their compact form. For these various reasons, the pruning of evergreens is usually done with the finger nails rather than with the saw.

Such pruning of Arborvitaes is advised in the Spring to keep the trees compact

Most evergreens shipped from nurseries are supplied with ball and burlap and it is seldom necessary to do much pruning at planting time, but, if the root system seems poor, it may be wise to remove part of the top to offset the loss of the roots.

For compactness, we can prune such evergreens as Firs, Spruces, Douglas fir and Pines by removing the center bud in each cluster early in the Spring. This is done merely with the finger nail or a small pen knife. Removing this bud causes the growth of the side buds, which helps to fill in vacant spaces. Whenever a tree is lop sided, the buds should be removed from the side of the tree which is making the vagrant growth.

In order to induce compactness in the Arborvitaes, Junipers, Retinosporas and Hemlocks, a hedge shears is used to shear the plants early in the Spring, and if they make very rampant growth, we may want to prune them once more just before they come into their second period of growth, perhaps in late Summer. In the case of most of these evergreens, old branches can be cut back rather severely, but it is not wise to prune Pines, Spruces and Firs by this method. These latter named sorts do not tolerate pruning which is done severely enough so that cuts are made beyond the foliage.

We may keep our evergreens at any desired height by removing the leading shoot. In the case of Firs and Spruces, we may ruin their normal pyramidal form, but at least we can induce the trees to become more compact and better suit some definite position in our garden.

Should the leader of a Spruce or a Fir be destroyed by accident or storm, it is always possible to select one of the branches below the dead leader and tie it to a stake in an upright position, whereupon it will often assume the role of a new leader. Of course, with Hemlocks, Redcedars, Junipers, Retinosporas and Yews when used in foundation planting for formal affects or for any definite garden feature, we are not concerned with leaders and we prune these evergreens to suit our use. This pruning is done in early Spring.

It will not be necessary to mention that evergreens should not be pruned unless one has a definite reason in mind.

What to Look for When Selecting Trees

1. Trees will be just as dependable as is the name of the firm behind them.

2. One gets exactly the same value as he pays for.

3. Reasonably straight trunk, unless you are choosing a picturesque type of garden tree.

4. No bad crotches or stubs.

5. Street trees branched at least 7 feet from the ground.

6. A well balanced top.

7. An abundance of fibrous, feeding roots.

8. Ball-and-burlapped trees require 9 inches of ball for each inch of trunk.

— Russell N. Barnes, *Real Gardening*

Chapter XXIII

TREE REPAIR

As trees grow and mature, they, like most other living things, become more and more susceptible to injuries and diseases which may result in death before their natural time. Man has for hundreds of years sought various means of preventing the spread of decay in trees. In 1640 Lawton and in 1664 John Evelyn, both Englishmen, advised the cleaning of cavities and plastering with tar and oil, or covering with tarpaulin. As the populations have become more dense and trees less numerous in proportion, a greater appreciation of trees has resulted. There has been a constant increase in the efforts made to protect them from all kinds of injuries and diseases.

Modern science has added much to the practice of tree repair, and here has been rapid progress in recent years. John Evelyn stated almost 300 years ago that when a tree decayed it was usually because of an ignorant or careless arborist. Just as preventive medical care is more efficient for the human body, so is preventive tree care more effective in preserving the health and beauty of trees.

In the preparation of this chapter the writer has attempted to incorporate the opinions of tree experts who devote their entire efforts toward preserving trees in good health. I am, therefore indebted primarily to Charles F. Irish of Cleveland, O., also to Martin L. Davey of Kent, O., and F. A. Bartlett of Stamford, Conn.

Prevention of Tree Troubles

Preventive tree care, writes Charles F. Irish, should consist of the following:

1. Keep the tree in vigorous growth by supplying sufficient food and moisture. See page 103.

2. Keep it free from insect parasites.

3. Prune back top where the roots prove unable to supply enough food to sustain vigorous growth. Make all pruning cuts close to the main branch or trunk so as to permit rapid covering of the wound by a bark callus. Paint all wounds. See page 119.

4. Bracing. Many trees, Elms in particular, frequently form a narrow "V" crotch, which, in the course of growth of the tree, is forced

A splendid example of tree repair. The branches are securely trussed and the cavities are neatly filled. Note the use of the Wintercreeper, Euonymus radicans, to hide the repair work—(Courtesy of the Davey Tree Expert Co.)

apart and so is very easily split in ice and wind storms. Such splitting may be anticipated and prevented by bracing. See page 120.

5. Protect from lightning by placing lightning rods upon important trees in exposed locations.

If you have a valuable tree upon your grounds, it would be well to note the size of the leaves, the length of the twig growth as shown by the distance between the rings of terminal bud scale scars. Should you see that the size of the leaves is smaller than usual, their color a paler green, that they have been later to leaf out and earlier to drop, the twig growth shorter, it may mean that there is a food or water shortage or some change in the water level, or that some parasitic condition is present. Another sign of the presence of an injurious condition is a number of dead or dying branches. Monteath, in his "Forest

Guide" in 1821, advises that if a tree appears to be failing, the first place to look for the trouble is at the root. Therefore, having assured oneself that there is no injurious condition or food shortage in the soil, one may look for the trouble in the top or in the branches themselves.

Cavities may be found which endanger the tree; fungi or insect parasites may be present and the tree should be sprayed to correct the condition. The first step would be to prune away the dead or diseased branches, and in some cases a pruning back of the green branches to effect a better balance between the root and the top and shorten the distance from the root to leaves. In the pruning of live branches, those which are growing in such a way as to form weak crotches or interfere with more desirable branches or tend to produce an ill-formed top should first be removed. In general, the removal of live branches

Note the extensive repairs on this tree. The cavities extend far up into each of the main branches, but the trees are thriving—(Courtesy of the Davey Tree Expert Co.)

from the tree should be restricted to those which must come out for the benefit of the tree, as promiscuous removal of a large amount of live branches will tend to stunt the tree and produce an artificial shaped tree, which is rarely as beautiful as one permitted to grow more naturally.

Cavities usually arise from a wound or break in the bark. This may occur from the weak crotch, a frost injury, storm damage, a branch improperly removed, a carelessly driven automobile, or some other cause which afforded entrance of rot producing fungi. In addition to the fungi which attack a tree only on the exposed wood, there are others which attack through living bark, such as Chestnut Blight, or the Shoestring Root-rot (*Armillaria mellia*).

Having discovered cavities in one of the trees the first question you might well ask yourself is, "Can the life of this tree be prolonged by repairing this cavity? If so, will it justify the effort and expense?" Should the cavity be small, there is no question as to the efficacy of cavity repair. However, there are times when the cavity is so far decayed that it may be doubtful if any type of treatment would materially prolong the life of the tree, and the work of repairing might be so involved as to entail an expense beyond any value the tree might have. In such a case it would be more desirable to replace the diseased tree by transplanting a large tree and be assured of having a sound tree with the probability of a long life ahead of it.

Open Cavities vs. Fillers

In repairing trees it is sometimes the practice to remove all the decayed wood and leave the cavity open. Or we can fill this cavity with some material which shall resist the entrance of moisture and the spores of disease. Mechanical bracing is often essential. The work of repairing your trees must be in the hands of a man who thoroughly understands the growth of trees and who knows the danger of leaving diseased material within the tree. Some so-called tree doctors merely fill all cavities with some material without proper preparation of the cavities.

Advantages of Open Cavities*:

1. Wood more accessible for examination. It is assumed that the wood of the open cavity will need painting and disinfecting. In the use of a paint, the surface is covered and frequently decay is no more readily detected beneath the accumulated coats of paint which an open cavity may have acquired than if the cavity had been filled.

2. Wood is kept aired and dried and sometimes exposed to sunlight.

3. No unnecessary sound wood is sacrificed, thus saving the strength of the tree.

4. Only method possible in many cases.

*Mainly adapted from advice by R. C. Morrison.

5. Somewhat cheaper. However, in cleaning and continuously treating an open cavity over a period of years the open cavity might require as great an investment as if the original cavity had been filled.

But Martin L. Davey remarks:

Concerning the matter of open cavities, we consider them nothing short of malpractice. There is nothing to commend them. They violate all the rules of science and all the facts of long experience. The tree is much better left alone than to leave it with open cavities, because there never was a case under our observation that the cavity was not reinfected. The inside of the cavity, after it dries out, is bound to crack. These cracks run deep into the wood, sometimes two or three or four inches, and those cracks are an open invitation to the spores of fungus and they always become diseased again deeper than before and are much worse off. The open cavity method merely hastens the process of decay and premature destruction of the tree. We have conducted many experiments with open cavities as with everything else. We gave the open cavity method every fair chance to prove itself, but the results have *never* been right.

Advantages of a Filling

1. Improves the appearance.
2. Furnishes a surface on which the cambium can develop.
3. Prevents the entrance of fungous spores.
4. Forms a support for the otherwise weakened branch.
5. Prevents the harboring of insects.
6. Retards spread of fungi by excluding oxygen; therefore, even though the fungous infested area was not completely cleaned from the cavity its further spread would be retarded by a filling which sealed the cavity.

Cleaning the Cavity

The first step in the operation of cavity treatment is to clean the cavity. Wm. Forsyth, in 1791, was quite precise in his instructions relative to cavity treatment, stating that the cavity should be cleaned to the quick sound wood, taking care to cut the bark back with a sharp tool. After which he advised the application of his plaster made of cow dung, ashes and other strange materials.

There is quite an art in cleaning a cavity even though it be a small one. Tools required to repair a small cavity are a mallet and carpenter's chisel and gouge, knife slick or trowel. On large cavities it may be more practical to use pneumatic or electric drills. There are now on the market portable outfits specially designed for tree surgery work. In starting to repair any cavity the first operation would be to trim the bark back from around the cavity. In removing this bark and subsequently working about the cavity, great care must be taken to avoid

TREE SURGERY

Note that in the sketch at the left the area excavated is rounded at top and bottom. Such injuries do not heal as readily as would the same area of bark pointed at top and bottom, as is shown at the right

springing or knocking bark loose from about the cavity. If the bark is sprung, it invariably dies back from the edge of the cavity, resulting in a delayed healing and a greater chance of re-infection before the callus can grow over the exposed area. Having cut the bark back from about the cavity to a point which you believe will permit the cleaning of the cavity, the edge of the bark and exposed wood is shellacked at once to prevent drying back. In this cutting back of bark, top and bottom should be cut to a sharp "V". In cleaning out the decay, the cavity should be worked to a point top and bottom with sides sloped parallel with the grain of the wood, and the back wider than at the opening so that the filling will be readily retained, the top and bottom of the cavity sloped to avoid moisture getting in or being held. The bark should be trimmed back so that ½ in. of the wood beneath is exposed and shellacked immediately.

Disinfection

Having removed the decay the cavity should be disinfected with a solution of one part bichloride of mercury and one-thousandth parts

of decay. The cavity being a small one and requiring no bracing, is now ready for the filling.

Bracing

However, most cavities which are 2 ft. or more in length and have destroyed one third of the volume of the tree or branch at that point, should be braced. On the larger cavities, the bracing resolves itself into an engineering problem and it takes experience and judgment to place the bracing so as to prevent the tree twisting away from the filling, and permits it to sway and twist in unison with the tree. This bracing is effected by cross rodding the sides of the cavity in such a way as to hold the filling tightly to the wood, even though the tree be swayed by the wind. In long cavities it is necessary to brace and truss lengthwise in addition to the cross bracing.

Tree Fillings

The ideal filling material has not yet been found. There are some experts who say cavities should not be filled, but merely cleaned and sterilized, braced and periodically painted. I know of some cavities 50 ft. in length which have been treated in this way for 18 years. However, in general, it is more practical and more economical to fill the cavity, as the great expense in cavity treatment is not in filling, but rather the labor involved in cleaning the cavity.

There are a number of kinds of fillers being used by various tree surgery operators. Concrete usually is the easiest to obtain and apply. There are places where its weight, rigidity and tendency to cause condensation of moisture on the bark of the cavity are against it.

Martin L. Davey writes:

As far as filling material is concerned, we are not wedded to any particular kind. It does not make the slightest difference to us what we use and there is no material that we could not use. All of our multitude of experiments indicate that good, old Portland Cement is the best filling material by long odds.

There are a number of processes of filling up the cavity with wood blocks cemented together with asphaltum or similar material. There is a fiber material made from roofing paper scraps with which some experts have satisfactory results.

There are those who advocate the use of a magnesium cement filler, in which case special means must be taken to prevent the filler from coming into contact with the sapwood, or the rain falling off the filling from coming in contact with the bark.

There is the Van Yahres method of filling cavities with cork and asphaltum.

Dr. W. H. Rankin, pathologist at the New York Agricultural Experiment Station at Geneva and with the Bartlett Tree Expert Co., as a result of experiments, concludes that a product which has been called NuwuD (a commercial filler material), is superior to concrete as a filler.

It utilizes wood fiber as a base with magnesium compounds for a binder. It is an adaptation of marine decking wherein permanent flexibility and tenacity are component factors. Where NuwuD was used the bark callus had covered from one-third to one-half greater area than in cavities filled with concrete.

Each filler presents certain advantages and disadvantages as compared with the others and the particular job must determine the kind of filler best suited.

There are some who recommend capping the cavity in such a way that the cavity is covered and sealed and no effort is made to remove the decay, the thought being to hermetically seal the cavity, thereby preventing further spread of the fungi, having previously placed an insecticide in the cavity to kill any insects present. There is some scientific data upholding this theory; however, how practical it will be has not yet been demonstrated.

How to Fill Cavities

In filling a cavity with concrete, a mixture of two parts of clean, sharp sand to one of Portland cement should be used. The sand should be free from coarse gravel. The sand and cement should be mixed dry. After being thoroughly mixed they should be moistened with enough water so that the mixture will be just moist enough to retain its shape when squeezed in the hand.

The cavity to be filled should be marked off at the points where sections will be placed. These sections will be made with heavy ply roofing paper. After the concrete is placed in the cavity it must be tamped, otherwise it will have little strength. The filling should be built out fuller than necessary and when it is built up sufficient for a section, the top should be smoothed off with a slight pitch to the front of the cavity in order that any moisture occurring in the back of the cavity might drain out, as well as to prevent any moisture from penetrating into the cavity through the joints. This operation is repeated until the cavity is filled, then the surplus concrete is slicked off and the surface smoothed down until it is flush with the line between the bark and the wood, and conforms to the contours of the tree. Should the cavity be a large one, the smoothing up of the surplus of the concrete should be accomplished before the concrete sets.

Slime Flux

In Elms especially, and occasionally in other trees, one finds that the sap continues to ooze out of the cavity. This is called slime flux, and there is no known remedy. The only practical means of caring for this condition is by draining it off by drilling a hole beneath the cavity in such a way as to intercept the flow and place a ¼ in. pipe in the hole. The sap flows out the tube and drops clear of the tree.

Exclusion of Air

Dr. W. H. Rankin remarks:

The old theory of the necessity of tediously excavating large amounts of partially decayed wood to remove the fungus is obsolete. The complete eradication of the fungus is an unnecessary factor if correct filling methods are used. . . . Many trees are injured and weakened structurally by the removal of large amounts of partially sound wood.

He has called attention to the fact that where the decay is sealed in so that the filling excludes all air, further spread of the disease ceases, so that he contends the cleaning of the cavity is not so important to remove all infection, but sealing up the cavity with an air-tight filling is more important. Mr. Irish remarks:

This, I would think, is really the most important advantage of a filling, but some would hardly go as far as Dr. Rankin in expecting it to entirely control further spread, as cavities in trees are the result of a number of fungi, some of which are able to function with very small amounts of oxygen present and I believe all trees would have this amount present irrespective of the filling.

Conclusion

Martin L. Davey concludes:

Nature at her worst is better than the wrong kind of work badly done.

Unfortunately, tree repair is rather too difficult for the amateur and it may be well to leave a cavity alone when it cannot be properly treated. Tree surgeons should be called into consultation upon valuable old trees. Some trees are not worth the cost of repair. Each person must decide such matters for himself. Bear in mind that tree repair is a painstaking process, entailing much hand labor, and the cost may be greater than first estimated. Tree injuries and decay are not always evident in a superficial examination.

Chapter XXIV

TREE PESTS

I wish that we might say that trees are free from all insect pests and diseases, but this is not true. In fact, there are so many tree pests that entire books are devoted to this subject. Naturally, we cannot go into details in this book but will suggest certain sources of information which will be readily available in the libraries of your community.

"The Plant Doctor"—*Cynthia Westcott.*

"1000 Garden Pests and How to Control Them" —*Cynthia Westcott.*

"Tree Experts Manual"—*Richard R. Fenska.*

"Maintenance of Shade and Ornamental Trees"—*P. P. Pirone.*

"Field Book of Insects"—*Frank E. Lutz.*

"Plant Disease Handbook"—*Cynthia Westcott.*

Your State Agricultural Experiment Station will help you if you send them a specimen of your trouble.

There are many pests which, of course, you can control yourself, but the greater share of the pests on large trees must necessarily be sprayed by men who are equipped with the proper apparatus to do the work thoroughly.

Let us remember that it is an unforgivable sin for a man to have a noted specimen of a tree which he allows to be devoured by insects and killed by diseases. It is almost an equal crime for a city to allow its trees to go into a state of disrepair. And you, as a reader of this book, should do your part to see that your city authorities are made aware of your love of trees and your desire to see them preserved for the next generation. Take a little of the blame for their neglect in your community.

Let us briefly analyze the troubles to which trees are subject:

Chewing Insects. The insects which infest our trees are of many sorts. First, we have the caterpillars and worms which eat the foliage. These can usually be controlled by spraying with one of the poisonous insecticides such as arsenate of lead. In this class of insects

come the Gypsy Moth, the Catalpa Moth, various canker worms, tent worms, bag worms and the Tussock Moth.

SUCKING INSECTS. Then we have the sucking mouth part insects, which include not only the many species of plant lice but also scale insects, of which the San Jose Scale and the Oyster Shell Scale are the commonest.

Scale insects are best controlled in Winter when the trees are bare of foliage. As an insecticide we usually employ one of the miscible oils. A miscible oil is one that can be mixed with water. The housewife is familiar with the fact that milk contains globules of cream which gradually rise to the top. Milk, then, is a miscible oil.

Besides these oils we have lime and sulphur, which can be purchased as a commercial ready-mixed product, to which it is necessary only to add water according to directions. The amateur should not make his own lime-sulphur.

The aphids and other sucking mouth part insects are not injured by poisonous insecticides such as arsenate of lead, for they work upon the young shoots of the tree, piercing the tissues with their beaks. These insects must be sprayed with nicotine extract, pyrethrum extract, or similar sprays, which actually hit the insects and suffocate them.

BORERS. A third class of insects is the borers, which eat their way into the trunks and branches of a tree, and are perhaps not evident until after they have removed a large area of the growing tissues of the cambium ring. It is then that the branch shows a general debility, and small masses of sawdust are found protruding from holes in the bark. Borers must be removed with a wire inserted into their burrows; they may be dug out with a knife or, some such insecticide as carbon bisulphide. Calcium cyanide can be injected in the hole, using a medicine dropper or hypodermic needle. The trunks may be sprayed with D.D.T.

Incidentally, these are the most difficult of insects to control as they are on the inside of the tree. Common borers are the Locust Borer, the Poplar Borer, the Hickory Bark Beetle, the Maple Borer and the Bronze Birch Borer.

DISEASES. First, we have the anthracnose diseases, which cause the blight of the Sycamore, Maple, Horsechestnut, Birch, Catalpa, Beech, Hickory, Walnut, Tulipfree and the Oak. The treatment for anthracnose usually depends upon pruning out and burning all the dead branches, gathering the leaves in the Fall and burning them, and spraying during the Winter with lime-and-sulphur, followed by a spray of bordeaux mixture as soon as the buds have expanded in the Spring.

Second in this class are the mildews and leaf spots. Mildews are diseases found on the surface of the leaves. They cause the leaves to appear whitish or grayish moldy, and result in their coloring and early dropping. Oaks, Birches, Dogwoods and Willows are particularly subject to mildews, which usually do not become prominent until rather late in the season. They are usually not troublesome except on young trees in a woods or thicket. They are generally controlled by dusting with powdered sulphur.

Leaf spots are frequent and there is hardly a tree which is not susceptible to some sort of bacterial or fungal leaf spot. Few of these leaf spots are extremely destructive, although some years one sort of a tree will be badly infected and the next year the tree will recuperate without treatment.

Whenever leaves are badly infested with leaf spots, they should be collected and burned as they fall from the tree, for the spores often Winter over in the soil. Spraying during the Winter with lime-and-sulphur will do much toward controlling the diseases for the next year.

Third in this class are diseases of the wood. There are many fungi which affect the wood of trees which are not in good growing condition due to improper pruning or as the natural consequence of the age and general debility of the tree. Cleaning the wounds and practicing general tree repairing will eliminate these fungi if they are becoming seriously entrenched.

Leaf scorch is caused by drought, unfavorable city conditions and gas-filled air. It is not due to a fungous disease. Such trees need pruning, feeding and care

Leaf Scorch. City trees growing in pavements and subject to the noxious gases of the passing automobiles, as well as the smoke from the many industrial plants and the home fires, show various results of these unnatural conditions. The leaves of some Maples, Horsechestnuts,

The bag worm so commonly found upon evergreens

Beeches and Oaks often have areas which are badly scorched. The main cause of this scorching is the inability of the roots to supply sufficient moisture to the leaves. The rapid evaporation from the leaves caused from the hot sun or by winds makes it impossible for the roots and trunks to supply as much water as is lost by the leaves. The margins of the leaves are generally the first to show injury.

Trees which scorch readily should be properly fertilized, pruned so as to cut down the leaf surface, and supplied with abundant water. But during Summer when drought is general, we must expect our city trees to become leaf scorched.

IN Kansas every old tree suggests the camp fires and wigwams of a vanished race and spreads its shade over a history in the making. To the prairie pioneer, whose horizon was bounded only by his power of vision, a tree among the billowing waves of green became as a sail on the sea, a harbinger of hope and contact with the infinite spaces.

The nomad needs no tree, and among the Argonauts whose restless feet carried them across the far-flung plains to the gold hills of the West, none stopped to plant the seeds and compose the land's first temples.

A pioneer among the trees and a missionary of better things to come was the Cottonwood, lifting its stately head to the sun and pointing to the midnight stars, drawing its sustenance from the bosom of Mother Earth, breasting with bared frame the Winter's blast and sending forth its pean of praise in a thousand aeolian voices with the Summer's breeze, it spread its shade like a benediction over the land.

—I. D. GRAHAM. "Trees of Kansas."

Chapter XXV

PROPAGATION

If we would know how to propagate any plant, we have only to observe Nature's own methods, and if we can copy her methods and observe a few scientific principles, we shall be able to perhaps improve the natural propagation of trees.

In Nature we know that the trees produce seeds which are dropped to the soil, carried by birds, or gathered by squirrels and buried. And for each kind of seed there are definite conditions which are favorable to germination. These conditions are moisture, soil, sometimes freezing. Necessarily these factors cannot be as perfectly supplied by Nature as we can furnish in our artificial conditions.

Many trees growing in the woods send up water sprouts freely from their roots; and many others, when brought to cultivation, sucker very freely, although this is not their habit in the wild.

Few observers have missed seeing two branches of a tree which have made natural grafts, or two separate trees which have grown together because the branches have rubbed against each other and finally grown together.

SEEDS

Tree seeds differ widely in their ability to grow, in the period of rest which they need before growing, in the length of time that they remain fertile, and many other factors. For this reason it is difficult to make all-inclusive statements relative to the growing of trees from seeds.

Classes of Seeds

Let us review briefly the present-day knowledge of the various kinds of seeds which trees produce.

1. Some seeds such as Willows, Poplars, Elms and Maples produce seeds which are ready to grow the moment they are ripe. They contain a great amount of moisture, which, if lost by a total drying of the seeds, prevents their germination. Naturally, such seeds as these should be gathered and sown as soon as they are ripe.

2. The seeds of some trees such as the Chestnut, the nut trees and the Oaks contain considerable oil, which becomes rancid when the seeds are not sown in conditions which are proper for their germination.

Most of these seeds, then, are sown soon after they are ripe, but inasmuch as they are sought for by squirrels and other animals, it is necessary to protect them by covering the soil with wire mesh screens, or sow them in boxes which can be placed in a protected situation.

3. In another class of seeds, the seed coats are very hard and bony, so that even though they are sown as soon as they are ripe, water penetrates to the germ of the seed very slowly. It is not uncommon to treat such seeds with boiling water to soften the seed-coat or immerse them in acid for a short period of time. For this purpose, acetic acid (which, of course, is vinegar), sulphuric acid and formic acid are used. Sulphuric acid and acetic acid are used full strength, and formic acid is diluted one part to 6000 to water the seed-bed.

Most noted in this group of seeds are the Locusts and the Kentucky Coffeetree, as well as a number of the leguminous plants.

4. Until a few years ago it was thought that when a fruit was ripe, the seed within the fruit was ripe too, but now it has been found that this is not true in all cases. Statements were made that "It takes two years for this seed to germinate," and "This seed must be frozen before it germinates." The main point is not that the seed takes two years or that the seed must be frozen. The facts back of these experiences are that many seeds are immature when the fruit is ripe, and need a period which has been called *after-ripening*, during which time the tiny embryo within the seed develops to quite a definite temperature, and for a definite period of time. Sometimes this temperature is constant, and sometimes it is necessary that it be fluctuating.

Curiously enough, many of the members of the Apple family need a period of after-ripening before the seeds will germinate, but I have included in the accompanying table a definite list of the many deciduous as well as conifer seeds which need after-ripening.

Most of the work in determining the scientific facts about the germination of seeds has been derived by the Boyce Thompson Institute, of Yonkers, under the direction of Dr. William Crocker.

For instance they have found that Holly seed contains a considerable amount of stored food but that the embryo within the seed requires from one to eighteen months after the berry is ripe before the seed is developed enough to germinate. In this case the embryo consists of a tiny mass of cells which is barely organized into a plantlet, but after a period of after-ripening, the embryo is able to penetrate the seed coat and grow into a vigorous seedling. See Ilex, page 251, for a more extensive discussion.

TIME AND TEMPERATURE (FAHRENHEIT) EFFECTIVE FOR THE STRATIFICATION OF VARIOUS SEEDS†

Name of seeds	Best temperature	Effective range of temperature	Best time (days)
Pinus austriaca	41	32-50	30-60
banksiana	32	32-41	60
contorta	41	32-50	60
coulteri	41	32-41	30
densiflora	50	32-50	30
flexilis	41	32-50	30-60
insignis	41	32-50	60
lambertiana	50	32-50	90
monticola	32	32-50	90
ponderosa	32-41	32-50	30-90
resinosa	32-50	32-50	30
rigida	41	32-50	30
strobus	50	32-50	60
thunbergi	41	32-50	30
Picea excelsa	32	32-41	60
canadensis	32	32-41	60
omorika	41	32-50	30
pungens	41	32-50	30
sitchensis	32	32-50	30-60
Abies arizonica	32	32-41	30
Taxodium distichum	41	32-50	30
Libocedrus decurrens	32-41	32-50	30-60
Thuja gigantea	41	32-50	30-60
occidentalis	32	32-50	60
Cupressus macrocarpa	32	32-50	60
Juniperus virginiana	41-50	32-50	65
Betula lenta	41	32-50	60-75
papyrifera	41	32-50	60-75
lutea	41	32-50	60-75
Liriodendron tulipifera	32-50*	32-60	70
Exochorda	41	32-50	50
Cotoneaster acutifolia**	50	41-50	280
horizontalis perpuscilla**	50	41-50	240
horizontalis**	50	32-50	240
dielsiana	50	50	70
zabeli	50	50	70
Pyrus ussuriensis (fresh seeds)	46	41-50	50
Domestic Apple	41	41-46	60-70
French Crabapple	41	41-46	84
French Pear (stored dry 6 months)	41	41-50	90
Japan Pear (stored dry 6 months)	41	41-50	100
Sorbus aucuparia	32	32-41	90
Photinia glabra	50	41-50	38
Aronia arbutifolia	32	32-41	90
Aronia arb. var. atropurpurea	50	32-41	80
Amelanchier canadensis	46	32-50	90
Crataegus oxyacantha	50	41-50	365

(*Continued on next page*)

*Daily or weekly alternation.

**After-stratification gave only 5-10 per cent seedling production. Planting in coldframes covered with board covers in February gave between 30 and 92 per cent seedling production the second Spring following planting. Open coldframes gave only 1-8 per cent. Mulched coldframes gave 9-25 per cent seedlings.

***No seeds taken out for planting until after 365 days' stratification. Probably adequate time for stratification is much shorter than this.

†Table taken from *Harvesting, Storage and Stratification of Seeds* by Dr. William Crocker, a talk before Ohio State University Nursery Short Course.

TIME AND TEMPERATURE (FAHRENHEIT) EFFECTIVE FOR THE STRATIFICATION OF VARIOUS SEEDS—Continued

Name of seeds	Best temperature	Effective range of temperature	Best time (days)
Rosa multiflora	41	41-46	50
rugosa	41	32-50	84
canina	41	32-50	270
fendleri	41	32-50	300
helenae	41	32-50	210
carolina	41	32-50	90
setigera	41	32-50	100
rubrifolia	41	32-50	360
Prunus americana	41	32-50	150
simoni (Apricot) carpel intact	50	32-50	45
simoni (Apricot) out of carpel	41	32-50	25
Peach (carpel intact)	41-50	[illegible]	[illegible]
Peach (out of carpel)	41	32-50	35-60
Prunus tomentosa (carpel intact)	41	32-50	75
tomentosa (out of carpel)	41	41-50	42
Damson Plum (carpel intact)	41	[illegible]	[illegible]
Damson Plum (out of carpel)	41	32-50	84
Prunus avium (Mazzard)	41	32-50	90
cerasus (Montmorency)	41	32-50	120
avium (Early Richmond) (carpel intact)	32	32-41	90
avium (Early Richmond) (out of carpel)	32	32-50	60
Acer palmata (Red Japanese Maple)	41	32-50	100-120
Carica papaya (Paw Paw)	50	32-50	[illegible]
Cornus florida	41	32-50	120
kousa	41	32-50	120
nuttalli	32	32-50	140
canadensis	icebox 43	43	150
mas	50	50	120
officinalis	50	41-50	300
Diospyros virginiana***	50	41-50	365
Arctostaphylos (Bearberry)	50	41-50	140
Fraxinus lanceolata	41	32-50	30
ornus	58	32-58	90

What Is Poor Seed?

There are many reasons why we often call seed worthless, among which are:

1. As seen in the foregoing pages, many times we do not understand the nature of the seed and the environment which it needs for proper germination. If we do not treat the seed properly to soften its coat, give it the period of after-ripening, or wait a sufficient length of time, we are inclined to feel that the seed is worthless.

2. Dr. Opal Davis made a careful study of Flowering Dogwood seed and said that the seed produced by trees which were grown in clumps was superior to that produced on isolated plants. In one lot of seed Dr. Davis found that 90 to 100 percent of the seeds from plants grown as lone specimens were infertile. Evidently this Dogwood needs to have its flowers fertilized by pollen other than that produced by its

***See foot of page 139.

own plant. Dogwoods growing in clumps had less than 10 percent of the seed empty. It was difficult to tell by inspection that these poor seeds would not germinate.

3. In examining a certain lot of English Hawthorn seeds it was found that they were badly infected with Ichneumon Fly. Seventy-five percent contained larvae, and ten percent of the seeds were without embryo. Therefore, only fifteen percent of these seeds could possibly germinate.

4. A great many seeds have fleshy seed coats, which serve as splendid media for growth of fungous spores. It is particularly true of such seeds as Magnolias, Yew, Hawthorn, Apple and Dogwood. When one lot of Yew seed was examined, it was found that 50 percent of the seeds had a fungus, which had spread through the embryo of the seed, and 50 percent had diseases upon the seed coats, so that as soon as the young plants attempted to grow they became infected. Because we know the danger of this fungus in destroying the fertility of seeds, we now find it wise to remove the pulp from all such seeds and treat the seeds with an organic mercury compound.

The pulp may be removed from the seed by soaking the fruit in water for perhaps 48 hours, which causes a slight fermentation, and after which generally the fruits may be easily crushed. The seeds will sink to the bottom, and the pulp will float. After this, the seeds are air dried.

The seeds should then be treated with Semesan, or one of the organic mercury compounds. These compounds are extremely valuable in serving as a means of killing fungi and bacteria. These may be used in powder or liquid form, either directly on the seed or on the seedbed.

5. Of course, seed is called worthless when it is too old or has been improperly treated in storage.

Stratification of Seeds

A common medium for stratifying the seeds some years ago was sand, but upon investigation it has been found that granulated peatmoss has proved the most satisfactory. It is superior to any other medium because it can be pressed free enough from water to give a good air supply and at the same time contain enough water to prevent excessive drying for long periods. It holds more than ten times as much water as sand.

Granulated peatmoss is quite acid, and when using it for such seeds as are likely to be injured by the acidity, a great deal of acid may be washed out with water, or it is possible to neutralize the peatmoss, using one-half pound of powdered limestone per bushel of moist sand.

The limestone, of course, must be thoroughly mixed with the peat. With most seeds, except Bearberry (an acid-lover), the neutralized peat gave better results than the natural peat, but even the latter gave very good results.

The peatmoss in which the seeds are stored for the Winter should, of course, be properly moistened, not too dry nor should any part of it be actually filled with water. It is wise to wet the peatmoss and shovel it back and forth from one box to another before it is used.

Dr. William Crocker makes the following recommendations for the stratification of seeds, which is the after-ripening treatment described on page 138.

A misconception has long prevailed concerning the best temperature for stratification of seeds. According to this misconception freezing or freezing and thawing temperatures are necessary. We have found this wrong for all the seeds we have studied thoroughly. Temperatures just above freezing (34 degrees to 50 degrees F.) are the most effective for stratification and no benefit appears from permanent or temporary freezing. Even the splitting of stone coats is not hastened by freezing. In Damson Plum seeds the stone coats crack first at 59 degrees F., and still later at 41 degrees F., which is the best after-ripening or stratification temperature for these seeds. In stratification a series of chemical changes generally occurs in the seeds and these changes certainly will not occur if these seeds are frozen up. As is mentioned in the table on page 139, several species of Cotoneasters give by far better seedling production when sown in a coldframe with a board cover than they do in an open frame or mulched frame or in stratification. It is not established that freezing is not of benefit to these seeds, but considerable freezing after the seeds are ready to germinate is likely to do injury.

To make stratification practical for seedling production two things should be known: the best temperature for each kind of seed and the length of time it should be stratified at that best temperature in order to give good seedling production. If a producer knows the temperature and time of stratification required by each sort of seed he uses, he can put them into stratification so as to have them ready to sow when Spring opens. Apple seeds, for instance, require 60 to 70 days at 40 degrees F. for complete after-ripening; after that time they begin germination right in stratification and need to be sown immediately. They should be stored dry until Feb. 1 and then stratified if they are ready to sow outside April 1. If it is desired to sow them outside on May 1 they should be stratified March 1.

Refer to the table on page 139 for the proper temperatures and days for after-ripening.

Low temperatures are not needed by all seeds, as for example the American Holly. See page 138. These seeds should be stored dry

until Spring, then sown in coldframes, for we have already mentioned the fact that the embryo in a Holly seed is entirely too immature to grow.

Sowing Seed

Otto Katzenstein of Atlanta, Georgia, in speaking before the Southern Nurserymen's Association, gave interesting directions for preparation of seedbeds for growing trees and shrubs, and it is from his lecture that I have derived most of the points here noted.

Seedbeds. When seedling trees are raised on a large scale, seedbeds are necessary, but for small quantities flats or abbreviated soap boxes, 3 to 4 in. deep, may be used. Fill the flats with soil to within ½ in. of the top; press it down firmly; sow the seed and mulch. Such flats can be stacked in a cool cellar or coldframe.

In arranging for seedbeds, spare no pains. Make them properly so that they may be permanent. Follow these suggestions:

1. Select a location sheltered from heavy east and northeast winds, and provide windbreaks in the form of hedges, planting, fences, etc., where natural protection is missing.

2. A well drained, sandy loam is the best soil. Naturally, heavy soils should have sand added to them and too sandy soils are improved by mixing some loam with them.

3. The soil should be worked to a depth of at least 12 in., should be free from stones and weeds, and by repeated raking or harrowing, should be brought to as fine a mechanical condition as is humanly possible.

4. The earlier the preparation of a seedbed is begun, the better results may be expected. Green manuring is very beneficial.

5. Well rotted cow manure or compost can be used but fresh manure, and particularly stable manure, should be avoided.

6. If the seedbeds can be kept under a hoe crop for a season, it will help to destroy weeds which might give much trouble later on.

7. The length of a seedbed depends upon the local conditions. The width may range from 3½ to 5 ft. Beds wider than 5 ft. are handled under difficulties only.

How to Sow. 1. Sowing may be made in drills or broadcast. Both methods have their advantages and disadvantages. Much depends upon local conditions. Seeds of conifers are quite frequently sown broadcast and particularly small quantities are generally sown across the bed. Seeds of deciduous trees and shrubs are more often sown in drills which run lengthwise of the beds. No hard and fast rule can be stated covering sowing in drills or broadcast.

2. The depth of sowing depends upon the size of the seeds. Many good seeds are needlessly sacrificed by improper handling. Funda-

mentally it is better to err by sowing too shallow rather than too deep. It is about correct to cover the seeds to their own thickness. Seeds of conifers require very light covering. Seeds of nuts, acorns, Honey-locusts, Kentucky Coffeetree and some others come up best from a depth of 2 or 3 in.

3. When sown in drills, allow for a distance of 4 to 5 in. between the rows for slow growing plants like conifers, and 9 to 12 in. for fast growing kinds, especially for most trees. Where cultivation by power is preferred, the distance between the drills should be 40 in. and the field is then not laid off in beds.

4. Before sowing, smooth and firm the soil.

5. For an experienced planter the sowing by hand is the best method, as the seeds can then be distributed evenly. It may also be done with the aid of mechanical devices or with a seeding machine There are a good many practical devices in use.

6. Very fine seed may be mixed with sand or earth to give it more consistency. Do not sow too thickly. Seeds should not touch each other or the danger of damping-off will be multiplied. After sowing, the soil should be firmed again with a board, or the back of a spade or a very light roller.

7. A light mulch will be found very beneficial. Peatmoss, chopped Sphagnum Moss, lawn grass refuse, pine needles, thoroughly rotted and pulverized cow manure, such as mushroom manure, where obtainable, make satisfactory mulches. Coverings of parchment paper also have given good results. Sawdust is not advised because it may rot, causing pernicious fungi to enter the seedlings. Leafmold may contain weed seeds and is to be avoided. The mulch must be removed gradually as the seedlings appear. The beds, particularly of conifers, should be kept shaded during the first Summer. This is not so important for beds containing acorns or nuts.

8. Handy screens are prepared by the use of building laths, by nailing burlaps on frames or by rolling canvas over the beds on elevated frames.

9. The screens should be placed 18 in. above the beds, the posts being raised gradually as the seedlings become accustomed to the light. Finally, they are removed.

10. Water cautiously, remembering that the beds being kept shaded and mulched will not need much water. When very dry, water early in the morning or late in the evening.

11. After the seedlings are up the beds should be cultivated carefully but lightly so as not to disturb the growth of the seedlings. The closest attention must be given now to judicious shading. The seedlings

of trees are kept in the seedbeds until they are large enough to be moved into nursery rows during the next planting period.

Evergreens from Seed. Evergreen seeds are usually sown broadcast in seedbeds which have been thoroughly prepared by using some well decayed manure in the heavy clay soil to make them more friable and of a better texture. Such beds should be about 4 ft. wide. Instead of sowing seeds in rows, they are usually broadcast in small patches. They will need shade for some time, so lath shades are often placed directly upon the soil. They may be elevated a few inches above the bed when the seeds have germinated and attained a little height.

Seeds of evergreens may be sown in Winter, Spring or Fall. In the Southern States, Fall is preferred. But in the Northern States, the seeds are usually stored in glass bottles until Spring. Pines and Spruces, Arborvitaes and Hemlocks are usually not stratified, but Red-cedars, Junipers and Yews are treated as advised for the after-ripening of deciduous seeds, for they need a period of after-ripening, and should be sown in the Spring. (See page 138.) At the time of germination, the moisture conditions for germination should be ideal. Any excess drying out of the bed will cause the young roots to die and the seed will apparently not have germinated.

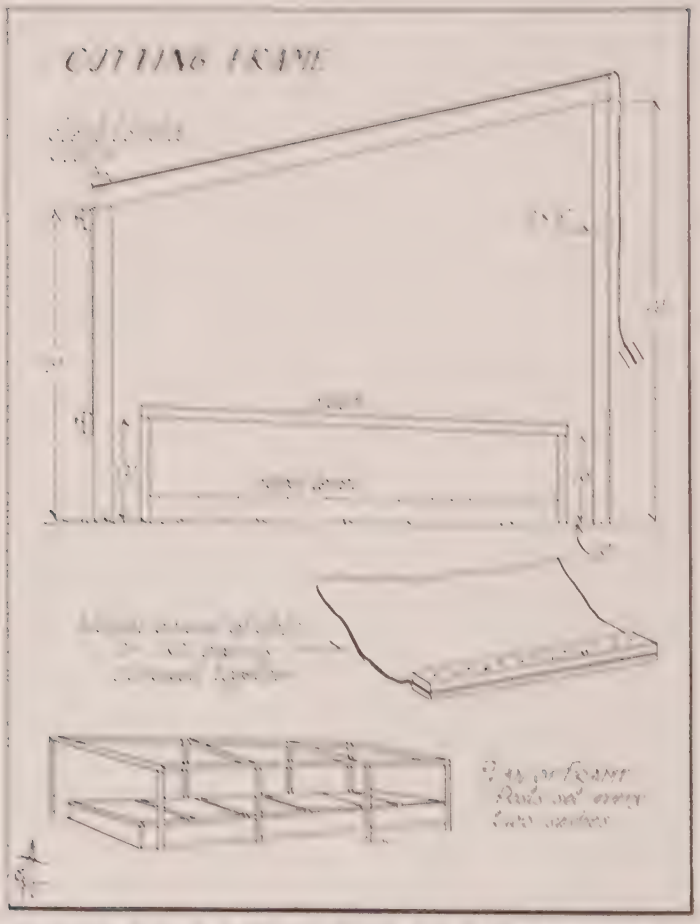
It takes from one to two months for most of the Spring sown seeds to germinate. Unless the seedbeds are well ventilated and the soil conditions ideal, which means that the soil should be moist beneath but rather dry at the surface, damping-off of conifer seedlings will develop very rapidly, and the seedlings should be given more air, and an excess of moisture should be avoided. At the same time, the soil should be sprayed with one of the organic mercury compounds.

Seedling evergreens will need to be mulched through the Winter with cornstalk, peatmoss or leaves until they have sufficient roots so that they are not heaved from the soil. It is usually desirable to transplant seedling evergreens to beds when they are 3 to 6 in. tall. This work is done in early Spring. After they have grown for a year or so in these beds they are ready for setting out in nursery rows or for a permanent place in the garden.

CUTTINGS

The writer has discussed the matter of making cuttings of shrubs very fully in "The Book of Shrubs," so that perhaps a brief discussion is all that is necessary in this book because the methods are similar.

We may make two sorts of cuttings of deciduous trees, softwood cuttings in Summer and hardwood cuttings in Winter.



An extensive series of cutting frames such as all nurserymen use for the propagation of tree and shrub cuttings during the Summer. Note how the muslin screen is used to cover the frames to protect the plants from the direct rays of the sun

Softwood Cuttings

Few trees are grown from softwood cuttings, the principal method of propagation being hardwood cuttings and seeds, so that we may here briefly review the principal points in the growing of trees from Summer cuttings.

A standard size coldframe, 3x6 ft., will hold many cuttings, although when more extensive operations are carried on, the frame is built in units of 3, 6, 9, 12 or more feet long, so that each section may be covered by a hotbed sash. The sketch on page 146 will show an extensive frame of this sort. Note that the frame is shaded from the sun, the muslin being placed upon the frame according to the direction in which it runs. The frames had best slant to the North or West, but not to the South. It is usually considered best to have the lower board on the North. We want light but not sun.

The shades are kept on the frame from 9:30 until 10 in the morning, and rolled up for the rest of the day.

Short cuttings, 3 to 8 in. long, are taken so that the cut is made just below or through the eye or node. Some of the lower leaves are removed, although experimental evidence seems to show that the more leaves left upon the cutting the better, inasmuch as each leaf stores some food to help cause rooting of the cutting. Treat the cuttings with a root promoting substance such as Hormodin or Rootone. The cuttings are generally rooted in sand, using a clean, sharp, coarse sand, which packs firmly but gives good drainage. If the sand has been used before, it may be wise to treat it with Semesan or an organic mercury compound to kill any disease spores.

Let the rows run across the frame, and gauge the distance apart by the size of the cuttings. The rows can be quite close together so that the sand is hardly visible. Of course, when the sand was placed in the frame it was thoroughly firmed and watered, and now after inserting the cuttings they should also have the sand packed closely about them, following which they are given a thorough soaking.

Hotbed sash should always be kept over them in order that the moisture and heat may be confined. As soon as the cuttings are rooted, the sash may be opened. Then, when the roots are perhaps ¼ to ½ in. long the cuttings are potted in tiny pots. If they have been rooted early enough in the season, they may be set out in protected beds or left to remain in the pots or stored in a coldframe for the first Winter.

Protect the young plants with cornstalks or the branches of trees, but do not smother them by using ordinary leaves or a heavy coat of straw. Straw will attract mice, and they may destroy the young plants. Many nurserymen use peatmoss to mulch the plants during the first

Winter. In the Spring they are set out in open soil and encouraged to make only one shoot. All other shoots should be removed.

The cuttings will vary greatly in the growth they make the first year. Some trees may be expected to attain a height of 3 to 4 ft., even taller, while others may not be so rapid. After their first Winter in the open soil, if the stems are not straight the trees should be cut to the ground in order to encourage producing a straight trunk.

The subsequent treatment of the young plant will depend greatly upon the desires one has in connection with the young tree. In some cases it would be desirable to induce the tree to branch low, and in others the lower branches should be removed. It is, however, a mistake to form a permanent head in a young tree: side shoots increase the diameter of the trunk and prevent the tree from becoming top heavy.

Hardwood Cuttings

During the early Winter hardwood cuttings may be made of many of our common trees, in which the wood of the previous year should be used, although with such trees as Willows and Poplars one can use older and more mature wood with equal advantage. The cuttings are made from 8 to 10 in. long. Longer cuttings are harder to handle, and shorter cuttings dry out readily.

In making the cuttings the top cut should not be made too close to the bud, as we intend that this bud shall grow, and when planted out, drying of the stub may also affect the bud beneath it.

The basal cut may be made just below a node, although this is not as important as nurserymen formerly believed. Cuttings may be tied in bundles of convenient size and stored for the Winter in peat-moss, moist sand or shingle toe. In any case, the medium should be just moist enough so that it is not soggy, but not so dry as to remove moisture from the cuttings.

If the storage of these cuttings can be properly handled, it may be wise that it should be around 50 to 55 degrees for the first three or four weeks, and during the remainder of the Winter at a temperature of 35 to 40. A higher temperature in early Winter will help to produce a callus, but lowering the temperature later will assist in retarding any top growth.

Rudolph Hacker of Painesville, Ohio, says that all one desires in storage is to have the cuttings callus. If they root freely they are harder to plant. Callus generally precedes rooting, and generally indicates that the cuttings are ready to root. Early in the Spring the cuttings are planted about 4 in. apart in a row, setting the cuttings so that only the top buds are above the soil.

During the first season they are given good culture and only one stem is encouraged to grow.

Evergreen Cuttings

Evergreens may be propagated (1) in Winter, (2) early Spring just before growth starts, (3) or in Summer. The cuttings are made about 4 to 7 in. long. Of course, the Winter cuttings need a greenhouse for rooting. The temperature of 30 to 45 degrees seems best. Higher temperatures are not advisable early in the season.

These cuttings may be set in boxes of sand or peatmoss, or they may be inserted directly in a greenhouse bench. Many growers favor the shallow boxes because they can be moved from place to place as they desire.

Summer Cuttings. It is generally advisable to use shorter cuttings in the Summer than those which are inserted in the Winter. They are inserted in the same sort of coldframes as advised for softwood cuttings of deciduous trees. It is, however, necessary that they be given good ventilation, otherwise they soon mold and decay. Such cuttings rooted in August will often root before freezing. Whether

A house filled with evergreen cuttings

they have rooted or not they will need some attention in Winter. Possibly during the Fall they will need watering. At least it will be wise to protect them by branches upon which some coarse litter is thrown.

SPRING CUTTINGS. Early in the Spring longer cuttings than those used in the greenhouse or for Summer cuttings are inserted in frames as early as April. Sometimes manure is used for bottom heat.

EVERGREENS WHICH GROW FROM CUTTINGS. Some evergreens root very slowly, if at all, from cuttings usually, most of the varieties of Rhododendrons, Pines, Hemlocks, Spruces and Firs. On the other hand many species of Juniper, Retinosporas, Arborvitae and Yew may be readily rooted as advised above.

HOW TO MAKE THE CUTTINGS. The cuttings are usually prepared by choosing wood of the past season's growth and removing some of the leaves from the base of the shoot, taking off just enough not so that one avoids burying any of the foliage. Cuttings may be made with a small slice of the parent stem. Such cuttings are known as heel cuttings. Generally this heel is not necessary, so that almost any shoot will root as readily. It is advisable to make the cuts as clean as possible, using a sharp knife or razor blade.

The reader is referred for more detailed information to "How To Increase Plants," by Alfred C. Hottes.

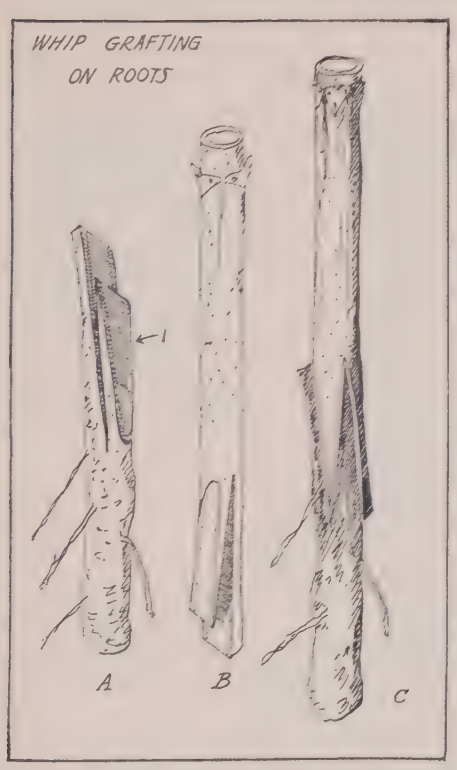
GRAFTING

Although most of our trees are raised from seed, some horticultural varieties do not reproduce true from seed, and they must be raised from cuttings or grafted. Grafting consists of choosing a strong rooted plant for the stock to furnish the root system for a small cutting, or eion, of a desired variety, which is inserted in this stock. It is very easy to explain and understand the various methods of grafting, but the success which results from grafting depends upon a little experience and a technique of being able to do each process accurately.

In attempting to graft trees for the first time, the reader should make a number of grafts and not expect that the first graft that he makes will surely grow.

The principle involved in grafting is that in most of our trees the bark is separated from the wood by a growing layer, called the cambium. It is this cambium, or growing layer, which has the ability to heal wounds and to make unions. Stated briefly, grafting consists of placing the cambium layer of the eion from the desired variety in contact with the cambium layer of the stock which produces the roots.

It will be necessary to discuss three methods of grafting.



WHIP OR ROOT GRAFTING
All parts are larger in diameter than necessary, to show characteristics more clearly. A, piece of root used as stock; B, a cion; C, cion fitted into stock

1. Root Grafting

In this method of grafting, cions are chosen from desirable trees and stored in moist soil, peatmoss, or sand in a cool place until you are ready to use them. Also procure a supply of pieces of root about the same diameter as the cions, and 4 to 5 in. long. Root grafting may be done any time in Winter.

In making the root grafts, observe the following points:

1. Make a long slanting cutting as shown in A of the sketch. Then make another cutting almost vertical in such a way that both sides of the slab marked 1 are straight and even.

2. Choose the cions, which should be 4 to 5 in. long, and prepare them as shown in B. The slanting cut in this case is the opposite of the one made in A.

3. When these cuts are made properly, they will fit nicely together and may be tied with waxed string.

4. As soon as they are made, they are tied in bundles of fifty and placed in boxes of sand, peatmoss or sawdust. Some nurserymen advise green sawdust from hard wood. This is of the proper moisture content and heats slightly in fermentation, which helps to callus them. By Springtime they are ready to set in nursery rows and are treated as advised for cuttings.

Root grafts usually are slightly superior to cuttings, inasmuch as they have a possibility of a larger root system at an earlier date.

Whip Grafting. Whip grafting is practiced in the same way except that shoots at the top of the tree, which are small in diameter, are used as the stocks on which the cions are fitted. Branches which are larger than ¼ to ½ in. in diameter are generally cleft grafted, but whip grafting is used on the smaller branches.

2. Cleft Grafting

The Weeping Mulberry is shown grafted high upon its stock. The cleft graft is used for this purpose

Cleft grafts are used upon branches which are at least 1 to 4 in. in diameter. The cuts on the opposite page illustrate the method, which consists of the following steps:

(1) Cut the cions wedge-shaped at the base and of equal size.

(2) Cut off the limb to be grafted rather close to the point of its origin.

(3) Let the stub generally be less than 18 in. long and anywhere from 1 to 4 in. in diameter.

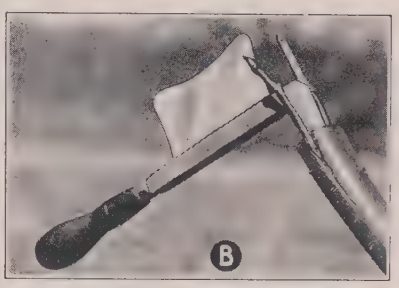
(4) Make a cleft in the stub splitting to a distance of not over 3 in. (See A)

(5) Insert two cions at opposite sides of the cleft with their thicker edges outward, the essential point being to get a contact between the layers of cambium of both stock and cion. The cambium layer lies between the bark and the wood. If the cions are placed slightly diagonal, the cambium layers are sure to cross.

(6) Wax all wounded surfaces so as to exclude air, moisture, disease and insects. (See C) These grafts can be wrapped to prevent the sun from melting the wax. (See D)

Cleft Grafting

A, a grafting tool is used to split the stock

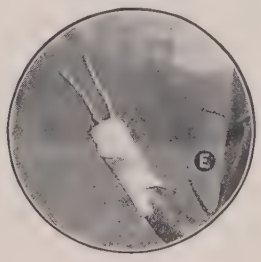


B, the split branch is pried open and two cions are inserted

C, melted grafting wax is being applied with a brush

D, the graft is being wrapped with cloth to prevent the sun from melting the wax

E, the completed graft is ready to grow—(Courtesy of Successful Farming)



3. Veneer Grafting

Most evergreens which are propagated in the greenhouse are propagated by veneer grafts.

Stocks for Evergreen Grafting. In general we may say that the varieties of any species can be grafted upon the type species, although many of the conifers are so closely related to each other that stocks within the genus may also be used. It may be well to enumerate some of the common stocks used:

Thuja aurea, standishi and *peabody*, on *Thuja occidentalis*.

Chamaecyparis (*Retinospora*) *obtusa* varieties on *Thuja orientalis* (*Biota*).

Cryptomeria lobbi on *C. japonica* (seedlings are tender).

Juniperus virginiana glauca on type or *Thuja orientalis*.

Koster Spruce on *Picea pungens*. Some believe this keeps them bluer, although growth is slower than on Norway Spruces.

Most *Chamaecyparis* work on common Arborvitae.

Juniperus keteleeri, pendula, virginiana glauca on *Juniperus virginiana* or *Thuja orientalis*.

Abies species and varieties on *A. concolor*.

Taxus varieties on *T. cuspidata*.

Pines, *P. ponderosa pendula* on type.

P. nigra used for *P. ponderosa*, *P. cordieri*, all of which have coarse grained wood.

P. strobus used for *P. aristata*, *P. excelsa*, *P. bungeana*, *P. cembroides*, *P. monophylla*, *P. edulis*.

Thuja occidentalis may be used for most Arborvitae.

Triomphe de Boskoop and *Chamaecyparis lawsoniana* on American Arborvitae because they grow better.

Grafting Conifers

Splendid notes on the grafting of conifers by J. W. Mallinson appeared in the *Florists Exchange* and *Horticultural Trade World* and are here quoted:

The Juniperus is one of the most important families of hardy coniferous evergreens grown in this country. Over thirty species and varieties are cataloged by some of the larger firms, and they vary in habit from tall, narrow columnar trees of great height as in *Juniperus virginiana* (Redcedar), to the bushy spreading types such as *J. chinensis pfitzeriana*, and to the low trailing forms such as *J. chinensis procumbens*.

All the Junipers are useful stock for the nurseryman and landscape planter to have on hand; indeed, the different types are almost a necessity if artistic effects in planting are to be achieved. The tall Redcedar and its many beautiful varieties of similar habit, such as *keteleeri*, *glauca*,

schotti, and *cannarti* will give height to a planting or group and relieve the formality so undesirable in evergreen plantings. *J. pfitzeriana*, *J. communis*, *J. sabina*, *J. tripartita* and *J. japonica*, are all of bushy, spreading habit, such as *keteleeri*, *glauca*, *schotti*, *cannarti*, giving variety and color which is indispensable if artistic effects are desired. *Tamariscifolia*, *procumbens*, *prostrata* and Waukegan, are of procumbent or trailing habit and can be used for the front of large groups, for the large rockery, or as a ground cover on rough or rocky ground.

Why Not Increase the Supply?

At the present time these choicer Junipers are none too plentiful in American nurseries, but as they are not difficult to propagate by grafting, there is no reason why their propagation should be confined to a few of the larger concerns. Some of the Junipers, especially the bushy and procumbent types, root very easily from cuttings, either in frames in Summer or in the greenhouse in Winter. Certain other varieties are very slow to root, however, and others make slow growth after they are rooted; it is these varieties that are usually grafted. The more important of those generally grafted are the varieties of *virginiana* mentioned above, and also the upright growing varieties of *J. chinensis*. The selection of other varieties to graft, will have to be left to the decision of each individual, according to requirements.

The Under Stock a Native

The under stock used for grafting all Junipers is our native Red-cedar, *Juniperus virginiana*. It is easily raised from seed, although it does not germinate until the second year after sowing. The seed is offered for sale by specialists in tree seeds, and in some localities, it may be easily collected from the wild trees. In such localities it may also be possible to collect young seedlings of the right size and condition, for potting up for grafting purposes. They should be about half the

A Juniper cion and the tool to make it with. Note the sharp slanting cut at the base, which is made on one side only. The other, perfectly straight side, is placed against the stem of the stock plant (toward the center) when the graft is made

Left, Redcedar stock plant established in 2¼ in. Rose pot with cut made in stem and ready to receive the strong healthy cion—in this case J. virginiana glauca, the Blue Redcedar. The lower branches were cut from the stock when it was potted up. Right, a completed Juniperus graft ready to be laid away in the grafting case. The cion shown is J. pfitzeriana, a variety which roots easily from cuttings. However, a graft like this will give a salable plant much more quickly —(Courtesy, Julius Roehrs Co., Rutherford, N. J.)

thickness of a lead pencil and have good roots and foliage or they are not worth collecting. Two year seedlings of Redcedar can be bought from many nurseries, making a specialty of lining out stock. The young plants should be ordered to arrive about the end of August and as soon as received the lower branches should be trimmed off about 4 to 6 in. above the roots, potted up into 2¼ in. Rose pots and plunged in a frame where they can be carefully watered.

Have Healthy Stocks

There is often considerable loss in grafting Junipers, chiefly due to unhealthy stocks. See page 381. Do everything possible to keep the plants in good health. An occasional watering with weak cow manure

water will be found beneficial. These potted stocks are brought into a cool house about four to six weeks before grafting at the end of which time good root action will have commenced. It is advisable to keep them a little on the dry side, but they should be well watered a few days before grafting and the roots must be thoroughly moist when put into the case.

In severe weather the cions should be cut a day in advance of grafting and allowed to thaw out in a cool, dark shed. The cions should be of last season's growth, cut from vigorous plants and average 8 to 12 in. long.

The Grafting Operation Itself

When everything is ready to start grafting, select the healthiest plants of the wild stock, and make sure that root action has started in every instance. The young roots will probably show through the bottom of the pot, but if not, knock out the plants and make sure.

Junipers and all conifers are grafted as low as possible, and when planted out, the union should be covered by an inch or so of soil. The veneer graft used on Rhododendrons is also used for Blue Spruce, but not for Junipers. The graft used most successfully is a modification of the side graft. In cutting, select the smoothest side of the stem and start about 2 in. above the level of the rim of the pot and make a downward cut about 1½ in. long. This cut should be clean and smooth and, at its deepest point, should be about halfway between the bark and the center of the stem.

Grafted Juniper after eleven weeks. The string having begun to cut into cion, it has just been cut by passing a knife down the stock side. The union is now complete and the cion has already begun to swell

Select a cion according to the size and strength of the stock as the latter will vary in size; a large stock with plenty of foliage, will carry a much larger cion than will a small plant. Cut the cion to fit, taking off a sliver of wood on each side, the same length as the cut in the stock. Do not cut to a tapering point but keep

the cuts parallel; about one-quarter of the diameter of the cion is deep enough to cut on each side. Now cut the end to a chisel shape on the best side, and the cion is ready to insert. One side of the cut on the cion is flat and the other has a chisel shaped point. The flat side goes toward the center of the stem and the sliver of wood and bark will easily bend around the end of the cion and should fit perfectly even at least on one side.

The graft is now tied with a waxed string, as shown in the cut on page 156. Be sure that the layer between stocks and cions meets at several points.

Heavy Shade Not Required

Junipers, however, do not need so much shade as do Rhododendrons, and early in the year they will do better if they are only shaded on very bright days. Growth will always be better with strong light, so long as there is no danger of burning. Open the case for about half an hour each morning to get rid of excess moisture, and after about four weeks the plants can be moved over in the case and part of the wild stock cut off. Gradually give more air until at the end of three more weeks the case is left open entirely.

The plants may now be placed on a bench in a close house and another portion of the wild stock cut off, leaving the remainder of the stock growth for two or three weeks longer, when it can be removed close to the union; the string should be cut at the same time. The young Junipers will need careful watering and sprinkling, but be very careful not to get them too wet. They can be carried along in a cool house until it is safe to plant them out. It is advisable to plant in a frame or a prepared bed under the sprinklers rather than in nursery rows; in this way losses are reduced to a minimum.

Important Points

The important points to be observed in grafting Junipers are:

Be sure the grafting stocks (Redcedar) are healthy and vigorous with plenty of roots and foliage.

Do not cut the stocks too deep or damage the bark in cutting or tying.

Be sure the barks of stock and cion fit perfectly even, and that they do not become displaced when tying.

Do not overwater either before grafting or after they are taken out of case.

The After-treatment of Grafted Evergreens

The removal of the head of the wild stock is a very important factor in the successful propagation of evergreens by grafting. The head of the wild or parent stock should not be entirely cut off at one time, but must be reduced gradually as the union progresses.

When the united conifer or Rhododendron grafts are taken out of the case and placed on the open bench in the propagating house, about one-third of the wild stock will still remain on the plant. This should not be cut away for a few weeks or losses will be almost sure to follow. As top growth commences, the stem will swell considerably, causing the string to cut into the bark. This should not be allowed to proceed too far or it may cause injury. The swelling of the stem is a sure sign that a perfect union has taken place, so it will then be quite safe to cut off the remaining portion of the wild stock, close down to the string.

A very sharp knife should be used and great care exercised so that the union is not strained. After the stock is cut off the string can be cut by drawing the knife down the back of the stock. It is not necessary to remove the small pieces of string as they will be under the soil when the plants are put out in the nursery beds, and will soon rot away and fall off.

Grafting Arborvitaes and Retinosporas

There are one or two choice varieties such as *standishi*, *aurea* and Geo. Peabody which do not, as a rule, succeed very well from cuttings. These varieties are so scarce at present that it is not advisable to take chances by trying to root cuttings, especially as they can be so easily grafted.

The same applies to the choice varieties of *Retinospora oblusa* such as *crippsi*, *aurea*, *youngi*, *nana compacta* and *gracilis*.

Almost all the varieties of *Thuja occidentalis* can be propagated by cuttings, either in frames in Summer or in the greenhouse in Winter.

Seedling *Thuja occidentalis* or American Arborvitae is the grafting stock used for all Retinospora and *Thuja occidentalis* varieties. Two-year-old seedlings well rooted in 2¼ in. Rose pots, are best. The graft used is the side graft as described for Junipers and the method of handling and treatment in the grafting case is exactly the same as advised for the latter. The varieties of *Thuja* or *Biota orientalis* (Chinese Arborvitae) are grafted on seedling of *Thuja orientalis*.

Grafting Cryptomeria and Sciadopitys

Cryptomeria japonica is used as the stock on which to graft *Cryptomeria lobbi* and *Sciadopitys verticillata* (Japanese Umbrella-pine). Spring sown *Cryptomeria japonica* seedlings will not Winter in a frame in this locality, so must be carried over the first Winter in a house and planted out in a frame in Spring. They can then be potted up about end of August for grafting the following Winter. The veneer graft as used on Blue Spruce is generally used for *Cryptomeria* and for *Sciadopitys*.

Taxus Grafting

Taxus cuspidata (Japanese Yew) is usually propagated from cuttings and seed, but there are several choice varieties of this species which make much better growth when grafted. *Taxus cuspidata*

capitata is a beautiful loose pyramidal form while *cuspidata brevifolia* is a low spreading type of very slow growth. Both of these are well worth grafting, as they are scarce and expensive.

There are several other good varieties of *Taxus*, all of which are well worth growing, for all are extremely hardy and keep their color well during Winter. The *Taxus* are grafted on two-year seedlings of *Taxus baccata* (English Yew); this can easily be raised from seed, but seedlings need protection in the house over their first Winter. The side graft is used for *Taxus* and the treatment in the case is the same as described for the Junipers.

Young grafted conifers are offered for sale for Spring planting. Some firms make the emphatic statement that a grafted conifer will make as big a plant in two years as a cutting of the same variety will make in four years, something well worth considering by both the amateur, the nurseryman and the florist grower.

Blue Spruce

At the present time one of the most scarce of nursery items is Koster's Blue Spruce (*Picea pungens glauca kosteri*). In fact salable plants of this in all sizes seem to be unobtainable.

The Blue Spruce has always been one of the easiest of evergreens to sell as it appeals to the tastes of the general public. As a specimen evergreen it certainly ranks very high; it has color, shape, hardiness and adaptability to all sorts of conditions and situations.

During the past few years, since importations have been cut off, the price of Blue Spruce has been steadily rising, the price of a 3 ft. specimen equals what was asked in 1915 for a 10 ft. specimen. The statement has often been made that we, in this country, can grow any plant that can be grown in Europe, providing the financial returns are sufficient. Surely the returns to anyone here who can propagate this Spruce and grow on perfect specimens in all sizes up to 3 ft. ought to be ample to give a very nice margin of profit.

Not an Easy Subject

Unfortunately, the Blue Spruce is not one of the easiest of conifers to graft successfully and the percentage of loss so far, has been very high with the majority of those who have attempted to propagate it. However, as one or two firms are reported to be succeeding unusually well with the propagation of this subject, there is every reason to assume that better results will be the general rule in future. The chief causes of losses are firstly lack of vitality in the understocks, and secondly too much heat and moisture in the grafting case.

The Norway Spruce, *Picea excelsa*, is the understock generally used for Blue Spruce. Two year-old seedlings about two-thirds the thickness of a lead pencil are the right size; these are potted into deep 3 in. pots about September, and plunged in a frame where they can be carefully watered. As vitality in the stocks is one of the chief factors

GRAFTING METHODS FOR BLUE SPRUCE—I
Back and front—or rather, inside and outside—views of Spruce cions ready to be inserted in cut stem of a Norway Spruce stock. The outer side (right) is left untouched except for the short slanting cut at the base

of success in all grafting operations, and as the subject under consideration is more than usually difficult, every care should be taken to see that these grafting stocks do not receive a check at any time; they should be in most vigorous health when grafted.

Pot Up Selected Stocks Only

Two year seedling Norway Spruce are cheap so it will pay to pot up only the very best plants. An occasional application of cow manure water after they have been potted a few weeks, will help to keep them in good health. Some growers prefer to pot these young stocks late in the Fall, and claim to get as good or better results from these than from the earlier potted. It may be advisable to try both methods, as the last word has not been said on this subject by any means.

The stocks should be brought into a cool house about December and kept rather on the dry side until root action commences when they can be grafted. It is safer to graft them before the roots actually become active, than to allow the plants to get into growth before starting operations. Some growers claim that the best time to graft is immediately the buds of the Norway Spruce stock start swelling up, whether the roots show action or not.

The veneer graft is generally used for Blue Spruce and the accompanying illustrations explain this sufficiently, so that further description is unnecessary. It is advisable to use waxed string for tying as unwaxed

GRAFTING METHODS FOR BLUE SPRUCE—II

At left, a two-year-old seedling of Picea excelsa (Norway Spruce) that was potted into a deep 3 in. pot in late Fall, with the stem cut ready to receive the cion. At right, the Blue Spruce graft completed and tied and ready to go into the grafting case. P. excelsa is the species regularly used for the stock

string may rot and break before perfect union has taken place. The roots of the grafted plants should be slightly on the dry side when put in the grafting case and the plunging material should be only slightly moist.

Grafting Should Be Done Early

It is advisable to get the grafting of Blue Spruce done before the end of February, so that they will be out of the case before hot weather arrives. The treatment in the case is exactly the same as that advised for Junipers, but if possible to do so, it is safer to lower the bottom heat a few degrees, as Blue Spruce will do better if kept cooler and rather drier than other conifers. They will need shade on bright days. A portion of the head of the Norway Spruce stock is cut off after they have been in the case about four weeks, at which time the plants should be moved over and cleaned up. Another portion of this understock is cut off when the plants are taken out of the case, which will be in about eight weeks from the date of grafting.

The Final Treatment

The remainder of the head is left for about four additional weeks, when it can be cut off close to the union. Great care must be taken when removing this growth, not to strain the union. The string can be cut at the same time. The young plants should not be exposed to drafts from the ventilators and they will need very careful watering, as the roots of Norway Spruce are easily injured by overwatering, while in the greenhouse. The young plants should not be taken outdoors too early as a late frost may damage the soft growth. Young Blue Spruce are valuable nowadays and merit room in a specially prepared bed or frame under the sprinklers. In planting, be sure to cover the union with the soil about an inch or so. They should afterwards be staked and tied and, before Winter, mulched with well rotted manure.

Chapter XXVI

IMPORTANT DECIDUOUS TREES

While it is true that some of the trees here described are evergreens, they are not conifers, for which see page 354.

Refer to map for reference to regions. For example, the Silver Maple on page 165 is recommended for regions 3 and 8, which refers to the map and discussion found beginning on page 70.

Key to Pronunciation

a, *e*, *i*, *o*, *u* without other vowels are short, as in ask, end, ill, odd, us

ay is long *a* as in make.
ee is long *e* as in mete.
y is long *i* as in hike.
oh is long *o* as in hoe.
eu is long *u* as in use.
ar is long *r* as in arm.

ACER—Maple

(Ay′-sur. Acer means sharp; perhaps spears were made from the wood).

Maples are among the most popular of trees for shade. There are species as graceful as a Birch and as bold as a Catalpa, sorts more brilliantly colored in the Autumn than if they were in blossom. In brief, Maples vary greatly in foliage, shape, density and size.

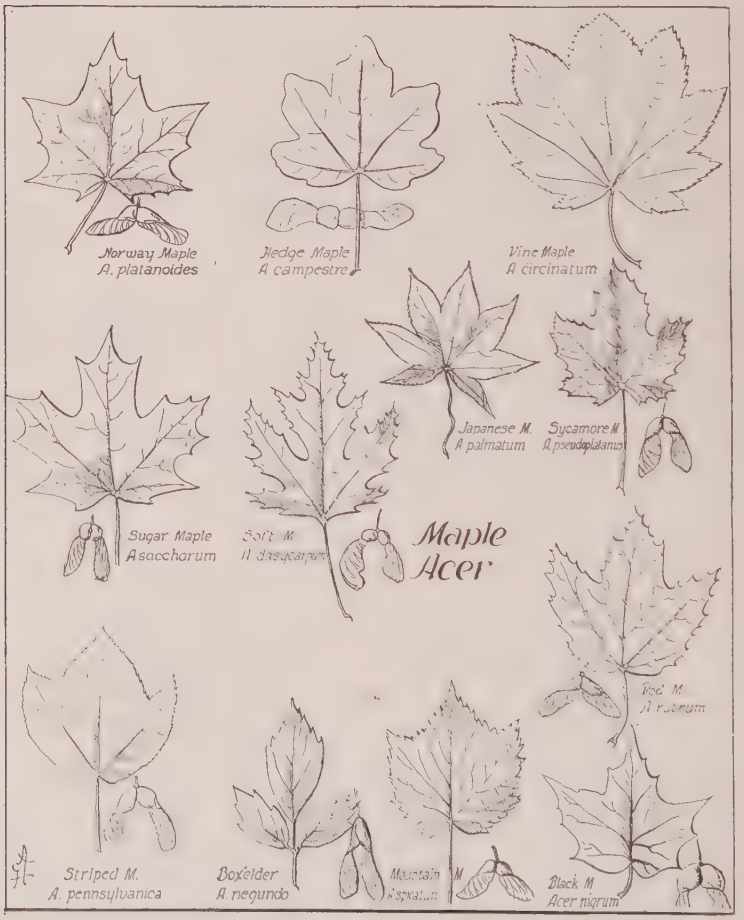
Botanical characteristics. Leaves opposite, generally palmately lobed, but in several species the leaves are three to seven parted. The flowers are five parted, produced in various sorts of clusters. There are usually eight stamens, but sometimes four to ten. The trees usually bear one sex only. The fruit is known as a key or a samara, being the names applied to winged fruits.

Hedge or English Cork M. *Acer campestre.* This tree has corky bark and small, handsome, thick appearing leaves, the branches extending down to the soil. It makes a round headed tree, 30 ft. tall, and the leaves are distinctly blunt lobed. The foliage is brilliant yellow in Autumn.

Vine Maple, *Acer circinatum.* This is native from British Columbia to California, and is hardy as far north as New York City. It is a shrub or a shrubby tree and becomes 30 ft. tall. The twigs are slender and smooth. The sepals of the flower are purple, and the petals, which are smaller, are white. The leaves are 2 to 5 in. across, cordate, with 7 to 9 acute lobes, and irregular and double toothed. During the Spring and Summer they are a bright green, turning to red and orange in the Fall. The red fruit is winged almost horizontally. The wood is fine and tough. The slender branches are used for the hoops of salmon nets.

Silver Maple, *Acer dasycarpum* (*saccharinum*). Also called Water, White, River, and Soft Maple. The Silver Maple is a native of Quebec, to Florida, west to Minnesota, Nebraska, and Kansas. (Region 3, 8.) It grows to a height of 120 ft. The bark flakes, exposing a reddish inner bark. The twigs have a rank odor. The flowers are greenish, precede the leaves and are not of ornamental value. The leaves are five-cleft to five-lobed, 3½ to 5½ in. across, silvery white beneath, turning yellow in the Fall. The keys have the wings at a wide angle, sickle-shaped. As a shade tree, it matures at a young age and its branches break easily in storms. The limbs are usually placed so that as they become older they are unable to support their own weight. Due to the lighter underside of the leaves, the tree is beautiful in the wind. Commercially, the wood is used for flooring and furniture, and for paper pulp. It yields about half as much sugar as the Sugar

Maple. It prefers a moist, deep soil and is easily transplanted. It can be severely pruned to confine its size. As a street tree it is difficult to keep the trees in shape, because the branches, due to their drooping habit, are constantly coming down below the level where



Leaf and fruit characteristics of the various Maples

The Amur Maple, Acer ginnala, has leaves which are three-lobed, the center lobe being the longest. In Autumn the leaves turn red

they are wanted. Variety *wieri*, introduced by Ellwanger & Barry, has more deeply cleft leaves with dissected, narrow lobes and more pendulous branches. There are all sorts of intermediate stages between the true Weir Maple and the typical Silver Maple.

Amur M., *Acer ginnala*. This plant grows in bush form frequently. The leaves are three-lobed, rather small, with a longer central lobe. The flowers and winged fruits are produced in long-stemmed panicles. The wings of the fruit are quite parallel. It is valued for its neat, bushy habit, and because the leaves turn red. It is a substitute for Japanese Maples. It is frequently cataloged as a variety of *A. tataricum* and is then called the Siberian Maple. "On dry soils it is short lived, as it is susceptible to blight," says M. V. Horvath. This Maple produces seed so freely as to exhaust the tree.

Paperbark Maple, *Acer griseum*. It is native to western China, and is hardy at the Arnold Arboretum. It attains 25 ft. The bark is tan-brown and papery, resembling the River Birch. Leaves three-lobed, the leaflets elliptical, 1 to 2 in. long, the middle leaflet with large, blunt teeth. Fruit with wings at almost right angles.

The Oregon Maple, *Acer macrophyllum*, bears the largest leaves of all the Maples. It is found wild from Alaska to California in regions 1, 2, 3 and 4. Trees grow 90 ft. tall and have a round head. The flowers are yellow, fragrant, in pendulous clusters, borne in May. The leaves are deeply three-lobed, 8 to 12 in. across, heart-shaped at the base, with the middle lobe also three-lobed, pale green and hairy beneath, the petioles often 12 in. long. The leaves in Autumn are bright orange. The seed ripens in September. The wings of the fruit spread at nearly right angles and the nutlets have yellow, stiff hairs. The branchlets are smooth and stout. It is related to the Sycamore Maple, but the trees are more spreading and with larger leaves.

Boxelder, *Acer negundo* (*fraxinifolia*). Also called Manitoba Maple, Maple-ash, and Ashleaf Maple. It is a native of New England and Ontario to the West and South. (Regions 9 to 18.) The trees have a broad, deep crown and grow 60 ft. tall. The twigs are reddish or green, polished, often with a bloom which easily rubs off. The leaf scars entirely encircle the twig and meet at a sharp angle. The flowers are yellowish-green, appear in April before the leaves, in pendulous clusters. The leaves are three- to five-parted, rarely seven, and 2 to 4 in. long. The keys are often incurved, meeting at an acute angle. Because of their rapid growth they are useful for retaining banks and making a quick screen. Because the branches are brittle they need a protected place. The wood is used for paper pulp and wooden ware. The trees are drought resistant and will grow almost anywhere, but they develop rapidly in moist soil. The leaves often become rusty.

Black Maple, *Acer nigrum*. Unlike the Sugar M., which it resembles, the leaves are generally three-lobed, hairy and not pale beneath, with a basal sinus nearly closed. The foliage is duller and therefore not much planted, although less affected by city conditions. (Region 26.)

Striped Maple, *Acer pennsylvanicum* (*striatum*). Also called Moosewood, Goosefoot Maple, and Whistlewood. This is a small tree, seldom attaining a height of 36 ft. It is found from Quebec to Wisconsin and south to northern Georgia. The branchlets are smooth, green and striped longitudinally with white lines. The pith is brown. The buds are stalked. The flowers are yellow, produced in pendulous, simple clusters, 4 to 6 in. long. The leaves are thin, roundish, wider

above the middle, three-lobed at the apex, the lobes point foreward. The young leaves are rusty-hairy. The foliage turns clear yellow in the Autumn. The wings of the fruit spread at a wide angle. This little tree is a charming Winter subject because of its ornamental twigs. The early settlers fed the branches to cattle and the moose are said to eat it freely. Without pruning, the plants generally become shrubby.

Norway Maple, *Acer platanoides*. This tree is a native of Europe and the Caucasus Mountains. (Regions 1, 3, 6, 7, 8, 21, 23, 24 and 28.) It produces a broad, dense head and attains a height of 90 ft. The

The shrubby Striped Maple, Acer pennsylvanicum, makes a small specimen of great beauty. See page 15 for bark characteristics

bark is very dark, and when seen across a lawn, it appears to be jet black as compared to most other trees. The branchlets are stout. The terminal buds in Winter are fat, red, often yellowish-green. The flowers are showy, greenish-yellow, produced in erect, many flowered corymbs. The leaves are five-lobed, 4 to 7 in. across, the lobes are pointed and remotely toothed. It is distinguished from other Maples by having a milky juice in the petioles. The keys are pendulous, with horizontal spreading wings. It has a wide use throughout the United States as a street tree, because it transplants well in large sizes and is tolerant of city conditions. Set the trees 38 to 40 ft. apart. It also does well at the seaside. It is inclined to have a low head and should be headed high at the start. It produces too dense shade and prevents the possibility of good lawns beneath it.

Variety *schwedleri*, Schwedler Maple. The young leaves are deep red, changing to a dark green. The flowers are yellow but are tinged with purple. Some persons object to the dullness of the leaves after the red is lost.

Variety *stollii* is superior to the Schwedler Maple because the leaves are not so dull. The leaves are more deeply three lobed.

Variety *nana*, Dwarf Norway M. Often grafted upon the Norway M. at a height of 4 to 5 ft. for formal effects.

Variety *columnare*, Column M., is less columnar than the fastigiate forms of the Sugar and Red M.

Variety *rubrum* (*reitenbachi*) is like Schwedler M., but the leaves may unfold green, turning and remaining red through the season.

Sycamore Maple, *Acer pseudoplatanus*. Called Sycamore in Europe. This Maple often lives 400 years and grows 90 ft. tall. (Regions 1, 2, 7 and 8.) The branchlets are smooth, producing green or reddish buds. The flowers are yellowish-green, borne on pendulous panicles on stalks 2 to 5 in. long. The leaves are five-lobed, 3 to 6½ in. across, heart shaped at the base, lobes ovate, coarsely round-toothed, smooth, dull green above, greyish beneath. The leaves remain until late in the season. The keys spread their wings at an acute or a right angle. It is a common street tree, resistant to insects and diseases. Rehder commends it for exposed places and near the seashore. It is intolerant of shade, but does well in all soils except those which are too moist. It is deep rooting and long-lived.

Variety *purpureum*. Leaves purplish beneath, contrasting with the flowers.

Variety *leopoldii*. Leaves striated and mottled white and yellow.

Red Maple, *Acer rubrum*. Also called Scarlet, Shoe peg, and Swamp M. It is a native from Newfoundland to Florida and west

The long flower clusters of the Sycamore Maple are distinctive

Minnesota, Iowa and Texas. (Regions 21, 23 and 31.) Although sometimes thought of as a small tree, it attains a height of 120 ft. The upper branches of the tree are quite gray; the branchlets are smooth, and the buds, like those of the Soft M., are clustered. The scarlet flowers come before the leaves and as a landscape feature have few rivals in March and earliest April. The leaves are 3- to 5-lobed, 2½ to 4 in. long, the triangular ovate lobes are irregularly toothed. They turn red and yellow in the Fall, although in Summer the leaves are dark, lustrous green above and grayish beneath with hairy veins. The petioles are frequently red. The keys spread their wings at a narrow angle, and are produced on slender stalks. During May these keys are red and very showy. As a street tree the Red M. is set 38 to 40 ft. apart. It is used for furniture and paper pulp. A denizen of

swamps and wet soil, Red M. is also found growing successfully on dry hillsides. It is tolerant of shade. Nurserymen say that persons do not buy the trees because they appear inferior to other Maples in the young stages.

Acer rufinerve has striped bark, the leaves turn crimson in the Fall, and the young branches are covered with a bloom like that on a plum. It is a native of Japan.

Sugar Maple, *Acer saccharum*. Also called Hard M. A native of Eastern Canada to Georgia, Alabama, Mississippi, and Texas. (Regions 1, 2, 22-28). The trees are of a dense, regular habit and because of its use as a shade tree, source of maple syrup, handsome Autumn foliage, and other uses it becomes one of the most popular trees. Its ultimate height is 120 ft. The bark is grey and furrowed, curving back along the edge, which "gives a plowed appearance to the trunk." The buds are narrow, sharp-pointed, and unlike other Maples, there are numerous scales. The flowers are greenish-yellow, borne in April in pendulous corymbs. The leaves are light green, 3-5-lobed, 3¼ to 5½ in. across, heart-shaped, the lobes sharp-pointed, coarsely but sharply toothed. They turn orange, yellow or scarlet, according to season and growing conditions. The keys have slightly divergent wings. As a street tree, set them 40 to 45 ft. apart. It is not one of the best trees for densely populated cities, the Norway M. being superior. It grows in all but soggy soils and roots deeply so that grass is possible beneath the trees. Proper pruning will train the trees to arch over a street. The wood is valued for interior finishes and furniture.

Mountain Maple, *Acer spicatum*. Also called Spike, Low, Goosefoot M. This sort grows from Labrador to Saskatchewan, south to Iowa or even northern Georgia. A small tree, or often a shrub, it rarely grows 35 ft. tall. The flowers are small greenish-yellow in spikes, produced in April and May. The leaves are light green, three- to five-lobed, coarsely toothed, heart-shaped at the base, the lower surface sometimes hairy. The foliage turns yellow and scarlet in the Fall. The fruits are bright red, conspicuous in Summer and Fall. The twigs are slightly hairy, reddish-purple, changing to reddish- and greyish-brown. The pith is brown. The buds are tiny, ¼ in. long, including a stalk. It likes shade, a deep loamy soil, and succeeds best on moist hillsides.

Tatarian M., *Acer tataricum*. This tree is bushy, often 25 ft. tall, less lobed than the Amur M., and of greater beauty, because after the seeds are mature, they have a salmon-pink color, following which the leaves turn brilliant scarlet—so red in dry soils as to appear painted.

PROPAGATION

Seeds. The wing-like seeds of the Maples do not have a long period of vitality. Except for a few of them, they do not germinate well when they become thoroughly dry. For this reason they are sown as soon as ripe or else kept in cool storage. *Acer macrophyllum* is an exception. The seeds will grow in Spring even if dry. The hairs on the seeds irritate nurserymen's hands. Some of the Japanese Maples with purple and deeply cut leaves come almost true from seed, so that one can always expect the certain percentage which resembles the parent trees. The Boyce Thompson Institute says that the Japanese Maple germinates after having been submitted to a temperature of 41 degrees for 100 to 120 days. (See page 140.)

Cuttings. Maples are sometimes grown from hardwood cuttings, especially the Boxelder.

Layers. Some Maples such as *Acer cappadocicum*, *platanoides* and *rufinerve* may be propagated by layering. In the nursery, trees are cut down to encourage long shoots, which are then layered. It often takes Maples more than one season to root.

Grafting. Varieties of Japanese Maple are usually grafted upon *Acer palmatum*. The Schwedler Maple and the Globe Norway Maple are budded or grafted on Norway Maple. Maples should be grafted in April and budded in August. The Wier Maple is budded on the Silver Maple. For more complete information on the grafting of Japanese Maples, see "The Book of Shrubs" by the writer.

AESCULUS—Horsechestnut, Buckeye

(Es'-keu-lus, or Ees'-ku-lus. From *esca*, nourishment; one species known to Pliny was edible. Others say this is the Latin name of an Oak or similar nut-bearing tree).

These trees are grown for their splendid display of flowers and their luxuriant foliage. It is a group with such good as well as such objectionable characteristics that one is puzzled to know how to evaluate the Horsechestnuts and Buckeyes. The flowers are truly lovely, but the leathery and often prickly seed capsules are a nuisance in cutting a lawn.

BOTANICAL CHARACTERISTICS. Leaves compound with the five to nine parts radiating like the fingers of the hand. The flowers are borne in upright pyramidal clusters (panicles). The Winter buds are large. The large seed capsules, sometimes spiny, split along three lines. See sketch on page 10.

The double flowered Horsechestnut is more showy than the usual type and does not produce the leathery fruits to clog the lawn mower

SPECIES.

Ohio Buckeye, *Aesculus glabra*. Also called Fetid B. Wild from Pennsylvania to Nebraska, Kansas and Alabama. This tree attains a height of 30 ft. and produces a broad, deep, round top. The flowers are a greenish-yellow, produced in panicles 4 to 6 in. long but not of great ornamental value. The leaves are five-parted, each leaflet being pointed. They turn yellow in the Fall. The fruits are leathery, prickly and contain from one to three seeds. Unlike the Horsechestnut, the buds are not resinous. Of little ornamental value, the Buckeye is a native of streams and ravines. The wood is used for paper pulp, woodenware, and artificial limbs.

Yellow Buckeye, *Aesculus octandra* (*flava*) (*lutea*) (*Pavia lutea*). Also called the Sweet B. The trees are found from Pennsylvania to Illinois and Georgia. They grow 60 to 90 ft. tall. The flowers are yellow, coming in May and June. The bark is light gray to grayish-

brown. The twigs are stout, reddish-brown to ashen-grey. The leaves are five-parted, yellow, green hairy beneath when young. The fruits are smooth, two seeded. A native of the rich bottom lands. The wood is used for lumber, paper pulp, artificial limbs, and veneer.

Red Horsechestnut (*Aesculus hippocastanum* × *A. pavia*) (*carnea*) (*rubicunda*) (*intermedia*). A round headed tree growing 45 to 75 ft. tall. The buds are slightly sticky. The flowers are flesh to deep red produced in panicles 8 in. long. The five-parted leaflets are 3 to 6 in. long, dark green, somewhat shining. The fruits are slightly prickly. The leaves are of a darker color and firmer in texture than the common Horsechestnut and the trees are more resistant to drought, although they like a cool, moist soil. Variety *brioti* has deeper red flowers.

Horsechestnut (*Aesculus hippocastanum*). A native of the Balkan Peninsula. The trees grow 75 ft. tall. The twigs are smooth, bearing large Winter buds at the end, which are varnished with a sticky gum. The attractive flowers are white, tinged red, appearing in May and June, and are produced "like a chandelier" or like "a giant's nosegay." The leaves are five- to seven-parted, each leaflet being wedge-shaped and obovate, that is wider at the top than at the base, doubly blunt toothed. The young leaves are rusty hairy. The fruit is spiny, 2½ in. across and contains one or two seeds which have a chestnut brown coat with a large lighter colored eye. The Horsechestnut is extensively used as a shade tree both here and in Europe. It is said that 17,000 have been planted in Paris. Sabots are often made from the wood. In Ireland the fruits are soaked and used to whiten clothes. They prefer a deep soil, and in hot, dry places lose their foliage before Summer is over. As a street tree they are constantly dropping mussy flowers, immature fruits, and later spiny nuts to clog the lawn mower. Loudon writes: "The manner in which it scatters its flowers on the grass, and the comparative uselessness of its fruit and timber, make it an excellent emblem of ostentation." A double flowered variety is more showy and does not produce the nuts.

Propagation

Seeds. Sow the seeds as soon as ripe, and do not let them dry, as they soon lose their vitality. If seed cannot be sown immediately after ripening it should be placed in damp sand until Spring.

Root cuttings. *Aesculus parviflora* is commonly propagated by root cuttings.

Grafting. Bud *Aesculus carnea* and the Double Horsechestnut upon the Common Horsechestnut in July, or veneer graft under glass in August upon young seedlings.

AILANTHUS—Tree-of-heaven

(I-lanth'-us. *Ailanto,* the native name meaning tree of heaven).

Few trees are as resistant to smoke, heat, and dry air of the large cities. Of this tree someone has written: "It is a tree that makes a dependable friend of poor children of the cities, for its seeds fly to barren spots or to cinder heaps and after they have germinated, strong healthy trees soon spring up, thus assuring a good shade for many American children who would not enjoy such luxuries in the hot Summer months. Owners of cheap rental property do not usually plant out shade trees for the benefit of their tenants. However, when they neglect such duties, Nature slips in stealthily and plants the seeds of the Ailanthus tree, and before the owner is scarcely aware of what has taken place, trees are growing in almost every conceivable nook."

Tree-of-heaven, *Ailanthus glandulosa* (*altissima*) (*japonica*). Also called Heavenwood, Chinese-sumac and Paradise-tree. The Ailanthus is a flat-topped tree with luxuriant foliage, almost tropical in appearance; it attains a height of 60 ft. (Grows in region 3 and 19.) The leaves are alternate, with from 13 to 25 leaflets, but always an odd number, frequently from 18 in. to 2 ft. long. The leaflets have two to four coarse teeth at their base. The terminal bud is lacking. The bark is smooth, with pale stripes and the pith is brown. The flowers are produced in large clusters in June and July, the male flowers have a bad odor. The fruit is oblong and winged. Variety *erythrocarpa* has bright red fruit. The wood takes a high polish and is satin-like. It is also used for woodenware and for making charcoal. It grows in almost any soil and tolerates shade. The odor of the male flowers, the fact that it self-sows its seed and suckers freely are its objectionable features. It is said that the abundance of pollen may aggravate catarrhal troubles and hay fever.

Propagation

Seeds. The seeds self-sow freely, so that if they are to be grown they can be sown immediately upon ripening, or stratify until Spring.

Suckers. Ailanthus suckers so freely that it may easily be propagated from either root cuttings or from suckers which spring up at the base of the trees. Propagate from pistillate trees only, as male trees have bad odor.

ALBIZZIA

(Al-biz′-zia. Named for Albizzi, an Italian naturalist).

The Albizzias are small garden and street trees with branches so arranged as to form a broad, spreading head. The foliage is locustlike, but it is very finely divided. They are natives of tropical and subtropical Asia, Africa, and Australia.

Botanical Characteristics. The leaves are bipinnate, the leaflets are small and numerous. The flowers are in spikes or in axillary heads, the stamens protrude from the flowers. The pealike pod is large and strap-shaped.

Albizzia julibrissin. This tree is found from Persia to Central China and grows in region 5. It grows 36 ft. tall and has a broad head. The flowers are light pink, in axillary spikes or heads flowering from June to August. The leaves are very dainty, being twice-compound with from 10 to 25 pinnae each of which has 40 to 60 leaflets. The leaflets are sickle-shaped and bear tiny hairs on their margins. The pods are flat, 6 in. long. The Albizzia is not hardy north of Washington, D. C. John M. McLaren writes: "The full effect of the beauty is had when it is planted on rising ground, against a background of Pine or other dark foliage, in full sunlight, in which it seems to delight." It blooms when other flowering trees are past.

Variety *rosea* bears dark rose flowers and is hardier and dwarfer than the type.

Propagation

Seeds. The Albizzia is one of the hard-seeded legumes. The seeds should be soaked in hot water for two hours. The seeds are best sown in February or March.

Cuttings. Mr. John McLaren says that cuttings are seldom successful.

ARALIA—Devils-walkingstick (Hercules-club) (Angelica-tree) (Tearblanket) (Monkeytree)

(Ay-ray-li-a. The name is of uncertain derivation).

The Devils-walkingstick (*Aralia spinosa*) is a treelike shrub bearing an umbrella-shaped crown of leaves and has stout prickly stems. In

A splendid group of Devils-walkingstick, Aralia spinosa, showing the abundant foliage and the large clusters of white flowers

favored places it attains a height of 30 ft. It is found wild over a wide area of S. Pennsylvania, S. Indiana, E. Iowa to Florida and E. Texas. The flowers are white and very tiny, but are produced in large carrot-like heads (compound umbels forming a large, terminal panicle) often 2 ft. long and a foot across; these appear in August, and are very showy. The leaves are often 20 to 40 in. long, cut into oval divisions 2 to 3 in. long. The stout branches are spiny, especially at the nodes. The fruit is very showy, consisting of black berries produced on red stems. These berries ripen in September and for one month are eaten by the birds.

Comparisons. The *A. chinensis* (Chinese Angelica-tree) has leaves which are made up of leaflets with very short or no stalks and the veins of the leaves end in the teeth. It is less prickly. *A. elata* (*mandshurica*) (*Dimorphanthus*) (*A. japonica*) has coarsely toothed leaves which are whitish beneath. The teeth of the leaves are far apart; in *A. chinensis* they are close together. The flower cluster has a short main axis, whereas in the other two species the main axis is much elongated.

Uses. Aralias will grow in the shade under trees which are not too dense. In too open situations, the heavy crown of leaves may cause the plants to break. The large mass of foliage, flowers or fruits makes this a most interesting background shrub which would be effective against a dark foliage background. Specimens are attractive but should be used only in larger plantings. Useful for Spanish architecture.

The juice of the fruit is said to be used as a black hair dye.

The large leaves, attractive flowers and fruit commend this tree for limited use in large areas.

Soil. They are not particular as to soil but are found wild in the more moist places. A rich, heavy soil adds to their luxuriant leafage.

Objections. For many locations the spines would be objectionable, especially where children would play about them. Some gardeners rub off the spines. Do not give them too conspicuous a situation as they appear like dead stumps in Winter. They sucker very freely and soon produce large clumps. Suckers are encouraged by every injury to the roots. They are top-heavy.

Propagation. 1. By suckers is the natural method; therefore, root cuttings are most used. Pieces of the root 3 in. long are started in the Spring in sand or moss. 2. Seeds may be used for quantity production, but usually it is too much trouble when roots are available. Sow seeds as soon as ripe or in Spring.

ARBUTUS—Madrone

(Ar′-beut-us. Incorrectly the accent is often placed on the second syllable.)

Madrone, *Arbutus menziesi.* It grows splendidly in California and in regions 1, 2, 3, and 4. The heathlike flowers are white and fragrant. The leaves are large, glossy, and smooth. The fruits are red or yellow. The bark sheds as in the Planetree and is chocolate brown.

Propagation

Seeds. Sow seeds as soon as ripe. Cover ¼ in. deep. Transplant when one year old, setting 8 in. apart. Move the plants each year.

Cuttings. After they are ripe in Autumn; place in peat soil.

BETULA—Birch

(Bet′-eu-la. The ancient Latin name of the Birch.)

Some type of Birch is familiar to all. They are noted for colorful bark, graceful branching, dainty leaves. Some species are so hardy that they grow farthest North into the Arctic zone.

Gerard observes that "schoolmasters and parents do terrify their children with rods made of Birch," and Evelyn adds: "Happy the man to whom its flexible branches do not recall to mind that they were formerly instruments of punishment to him!"

Botanical Characteristics. The leaves are alternate, usually straight veined, ovate, finely or coarsely toothed. The flowers bear one sex only, the male being long catkins formed the previous Fall and remaining on the trees all Winter; the female catkins are on the same tree and are also elongated. The fruit is a tiny winged nut.

Species

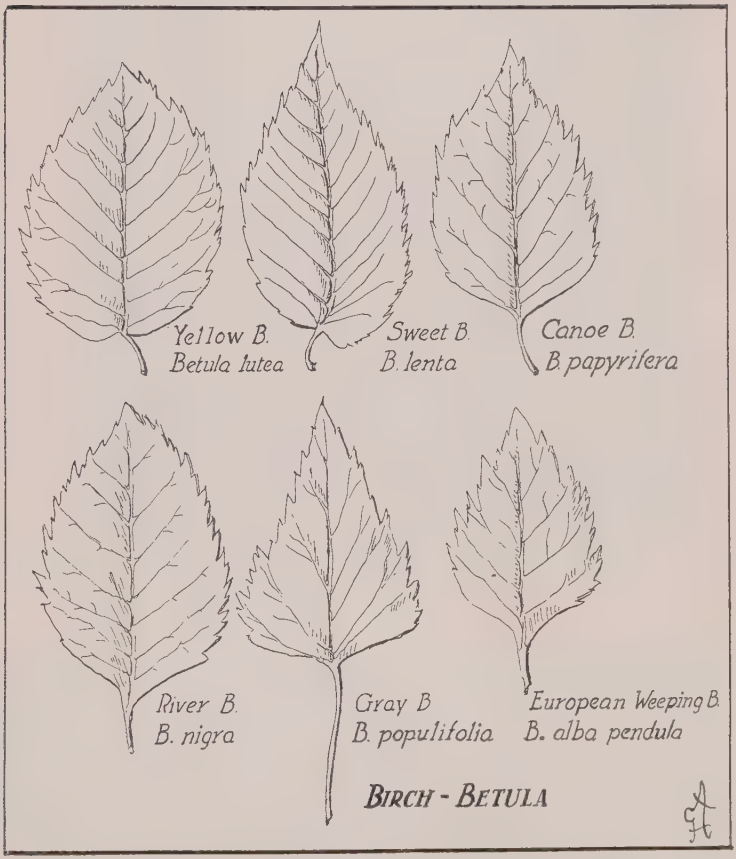
European Weeping Birch, *Betula alba pendula* (*verrucosa*). A native of Europe and Asia Minor, this Birch is short-lived but a handsome tree, growing 60 ft. tall. The main branches are upright, but the side branches are pendulous. The leaves are rhombic, 1 to 2¼ in. long, tapering at the tip, but often straight or wedge-shaped at the base, doubly and unequally toothed, smooth above but sticky to the touch when young. The bark is white and peeling. The bark of old trees is broken by deep black clefts. It is frequently planted among evergreens for contrast. It is best transplanted in early Spring when the leaves are as big as quarters. Ancient books, 700 years B. C.,

were written upon its bark. Coleridge calls it "The Lady of the Woods."

There are many varieties, among which are:

Variety *dalecarlica*. This is the sort most often planted. The leaves are deeply lobed (cut like those of Hemp) and irregularly toothed.

Variety *gracilis*, also called *laciniata* and *elegans laciniata*, is a weeping form with very deeply cut leaves, called the Cutleaf Weeping B.



Leaf characteristics of the various Birches

The white Birch has always been called "The Lady of the Woods" because of its graceful twigs and white bark

Variety *purpurea* has leaves which are purplish and is useful for contrast. Called the Purple Weeping B.

Variety *youngi* is the commonest weeping form. The primary branches spread to form an irregular head and therefore it assumes the habit of a weeping Beech. The twigs are slender and pendulous.

Yellow Birch, *Betula lutea*. Also called Gray, Swamp, and Silver B. A native from Newfoundland to Manitoba south to the peaks of Georgia and Tennessee. It grows 90 ft. tall. The leaves are ovate to oblong-ovate, 1¼ to 5 in. long, long pale hairs on the veins above and below.

There are nine to eleven pairs of veins in each leaf. The bark is yellowish or silvery gray, peeling in thin flakes. The old trunks are reddish-brown. The young bark is odoriferous and somewhat bitter to the taste. The Yellow B. likes a moist soil and does not succeed in the hotter regions. The bark is very resinous and is useful for starting the campfire inasmuch as it burns even in the rain and wind. The timber is used for furniture veneering and hubs of wheels.

Sweet Birch, *Betula lenta*. Also called Cherry B., Blue B., River B., Mahogany B., Black B., and Mountain-mahogany. It is found wild from Maine to Alabama and west to Ohio. A pyramidal tree when young, it finally assumes a rounded head with age and attains a height of 75 ft. The bark is like that of the Cherry, dark brown, close and fissured into thick plates on old trunks. The young bark of twigs is aromatic and of a wintergreen flavor. The twigs are reddish-brown in color and dotted white. The leaves are oblong-ovate, 1 to 4 in. long, sharp-pointed, heart-shaped at the base, sharply and doubly toothed, silky hairy beneath when young. The leaves have nine to twelve pairs of veins. The bark is a glowing color in Winter, and Prof. Franz Aust writes: "Its golden-brown branches seem to be radiantly alive." Oil of wintergreen is distilled from the twigs. For furniture and boat building its rose-colored wood is used as an imitation for mahogany. Its preference is for a rich soil upon slopes.

River Birch, *Betula nigra* (*rubra*). Also called Red B. This graceful tree with reddish-brown, slender twigs forms an ovoid head and grows 90 ft. tall. The trunk is likely to divide low down. The bark is reddish or cinnamon and sheds to appear ragged and torn, peeling off into papery flakes. The twigs are brown and hairy. The leaves are rhombic-ovate, sharp-pointed, doubly toothed, 1 to 3 in. long, whitish beneath with seven to nine pairs of impressed veins. The wood is used for woodenware and furniture. Because of its shredding bark it is confused with the Yellow B., but the bark of that species is more yellowish. The trees succeed best in moist, sandy soil and act as soil-binders when planted by the waterside.

Gray Birch, *Betula populifolia*. Also called Poplar B., Poverty B., and Oldfield B. It is found wild from Nova Scotia and Ontario to Delaware. Its characteristic is to grow shrubby in clumps with ascending stems, and attains a height of 30 ft. The leaves are triangular-ovate to triangular, 2 to 3 in. long, long-pointed and with a straight base, coarsely and doubly toothed, shining above, and when young they are quite sticky to the touch. The leaf stems are long and slightly twisted so that the leaf trembles like an Aspen. The bark is chalky or ashy white, quite close, and does not peel into papery layers as

Note the ragged bark of the River Birch and the fact that there are usually several trunks

does the European Weeping and the Canoe B. The twigs are densely glandular. The white bark is never renewed when once removed. It grows in dry and poor and often boggy soil, and is usually short-lived.

Canoe Birch, *Betula papyrifera* (*papyracea*). Also called White B. and Paper B. It is found from Labrador to British Columbia and Washington south to Pennsylvania, Michigan, Nebraska, and Montana. It grows 90 ft. tall. The leaves are ovate to narrow ovate, 2 to 4 in. long, sharp-pointed, wedge-shaped or rounded at the base, coarsely and doubly toothed, smooth above but hairy on the veins beneath. The bark is chalk white, peeling and with a pinkish or yel-

lowish tinge where not exposed to the sun. The twigs are dark brown, hairy and slightly glandular. It is the bark from this Birch that was so frequently used by the Indians for making wigwams and canoes because it is waterproof. The wood is used for spools, shoe lasts, and wood pulp.

Propagation

Seeds. The Boyce Thompson Institute says that the American species of Birch when first harvested germinate poorly at any temperature. Air-dried for a month they germinate only at a relatively high temperature, but if stratified at a low temperature there is a gradual fall in the temperature at which the seeds germinate, until after six months the stratified Birch seeds will germinate at the freezing point. Air-dried seeds of *Betula lenta*, *papyrifera* and *lutea* germinate only at 90 degrees, but stratified seeds at a temperature of from 32 to 40

Germination of Betula lenta Seeds (Collection October, 1926) at Different Temperatures After Various Treatments

Temperature during period of moist storage	Weeks in moist storage	Percentage germination at				
		15 deg. C.	20 deg. C.	25 deg. C.	32 deg. C.	Alternation of 15-32 deg. C.
Control (no moist storage)	..	10	0	2	33	67
0 deg. C.	4	80	80	77	72	75
	6	85	72	82	75	81
	8	77	79	81	82	77
	10	82	79	77	76	60
5 deg. C.	4	83	75	77	72	77
	6	70	81	57	72	77
	8	72	77	74	54	56
	10	85	76	87	82	82
10 deg. C.	4	7	22	24	58	78
	6	2	4	25	30	74
	8	10	10	16	54	72
	10	2	4	26	60	71
In frozen condition —15–8 deg. C. (soaked in water for a few hours at room temperature previous to storage)	4	0	0	0	15	37
	6	0	0	1	28	69
	8	0	0	9	22	72
	10	0	2	31	28	55

degrees F. The temperature at which germination occurs falls gradually lower and lower until, after five or six months, germination takes place at the stratification temperature, although 41 degrees is given as an ideal temperature. See also page 139.

From the statements above, it is evident that dry stored they will not germinate in the cold seed beds of early Spring. With proper stratification, however, there ought to be no difficulty in early Spring seedling production. Birch seeds are the only ones we have found in which the germination temperature falls greatly with stratification. The table on page 185 shows the value of knowing the proper temperatures for stratification.

Sow the seeds of *Betula nigra* as soon as ripe in June instead of Fall. They will often germinate immediately and one obtains good seedlings by August.

Layering. Birch trees with branches near the ground may be layered, or in the nursery they are sometimes cut back and mound layered.

Budding. *Betula pendula* and its varieties *youngi* and *pyramidalis* are chiefly budded.

BROUSSONETIA—Paper-mulberry

(Breu-soh-nee'-shi-a. Named for M. P. N. V. Broussonet, a French naturalist.)

Related to the Mulberry, Broussonetia is of rapid growth and becomes a tree 20 to 30 ft. tall with a tendency to produce many shoots from the soil. It is only hardy as far north as New York City and in regions 16 and 17. The male flowers are in catkins and are of little beauty; the female flowers are in globular heads.

The common species, *Broussonetia papyrifera*, is a native of China and Japan. The foliage is hairy and whitish beneath, heart-shaped or often deeply cut and lobed. The fruits are red and fleshy with a sweetish, insipid flavor and are produced in June and July. It is not particular as to soil, stands heat and dust and is useful in cities. The bark is used to make paper, the fibers being stuck together with rice paste. In Hawaii the bark is used to make cloth. The sap is used as source of glue in China. It is free from pests, but its great fault as an ornamental is its tendency to sucker; for this reason it is not used as a street tree.

Propagation

Seeds. Sow seeds when ripe. Each tree is either male or female, so that both sorts are necessary for seed production.

The Paper-mulberry is here shown with its globular masses of female flowers and unusual leaves

Cuttings. Hardwood cuttings are susceptible to freezing, so that they should be rooted in a frost-proof place.

Suckers. They sucker freely and grow readily from root cutting.

BUMELIA—False-buckthorn

(Beu-meel′-i-a. The ancient name for an Ash.)

False-buckthorn, *Bumelia languinosa*, also called Chittimwood and Gum-elastic, is seldom cultivated as it has little ornamental value. The tree is found native from Virginia to Illinois, to Texas and Florida. It grows 24 ft. tall. The rigid spreading twigs are often thorny. It

produces small, inconspicuous white flowers. The oblong leaves are 1 to $3\frac{1}{4}$ in. long and are rounded at the tip. They are a lustrous dark green, and are rusty or pale and woolly beneath. They do not fall till late. The berry like fruit is black. It thrives best in a dry, rocky or sandy soil.

Buckthorn Bumelia, variety *lycioides*. (Southern-buckthorn, and Coma.) This variety resembles the *Bumelia lanuginosa* but the flower stems, calyx and leaves are glabrous or a trifle hairy.

CARAGANA—Pea-shrub

(Kair-a-gay'-na or Kair-a-gah'-na. From *Caragan*, the Tartar name.)

Siberian Pea tree, *Caragana arborescens*. This shrub or small tree often grows 20 ft. tall. It is of extremely upright growth, coming from the cold regions of central Asia. It proves to be extremely hardy in the United States, being recommended in extreme northern regions. The flowers are yellow, pealike, and borne singly. They open in Spring or early Summer, and usually are not produced in great enough profusion, so that this shrub is not generally grown for its blooming qualities. The twigs are angled, due to the small wings of the bark, and somewhat spiny. The leaves are $1\frac{1}{2}$ to 3 in. long, obovate to elliptic, rounded at the tip. There are usually four to six pairs of leaflets. The rather unusual habit of this shrub and the clean foliage warrant its use as specimens for accent in a border of otherwise spreading shrubs. It is used for hedges and tall shelter plants in the cold Northwest. It thrives in any soil, but is found wild in sandy regions. It prefers sunshine and blooms at a young age. This shrub can be trained quite treelike by removing the lower branches when the plants are young. In order to keep the small trees in shape, they should be pruned frequently in the Summer, removing the oldest wood. The main fault has already been mentioned: many of the trees which are sold are not profuse blooming; they are too stiff in appearance for some uses.

Variety *pendula* is a weeping form which is grafted on the type, and it is a sort which is seldom seen except in European gardens.

Propagation. 1. Seeds may be sown as soon as ripe or kept till Spring. Soak for 48 hours before sowing.

2. Root cuttings should be made in Winter or Spring. The Weeping Pea-shrub is grafted on seedlings of *Caragana arborescens* after they have grown 6 ft. tall. Unless grafted upon the type, this cannot be expected to make a tree.

3. They layer readily.

CARPINUS—Hornbeam

(Kar-py′-nus. An ancient name, according to some, from *car*, wood; and *pix*, the Celtic for head; from its use to make yokes for oxen. Others say it comes from the Roman name for a chariot, *carpentum*, because it was used for making chariots. The English name Hornbeam alludes to the hardness of the wood.)

Botanical Characteristics. Small or quite shrubby trees. The leaves are more or less in two rows to form a flat plane, with 7 to 24 straight veins. The fruit is a ribbed, small nut to which is attached a large bract which is three-lobed.

The leaves of the Hornbeam are Birchlike, but the winged fruits are distinctive

Species

American Hornbeam, *Capinus caroliniana* (*americana*) (*virginiana*). Sometimes called Bluebeech, Ironwood, and Waterbeech. It is a native from Quebec to Minnesota and south to Florida and Texas. The Hornbeam is a bushy tree with slightly pendulous branches which are easily broken. The trunk is often zigzag, covered with a close fitting, bluish-gray bark. Blakeslee and Jarvis compare the bark to the wrist with the hand clenched so that the sinews protrude. It attains a height of 36 ft. The leaves are ovate-oblong, sharp-pointed, rounded at the base, sharply and doubly toothed, 2 to 4 in. long. The leaves turn scarlet and orange in the Autumn. It is commonly found growing in swamps and along the borders of streams. The wood is used for tool handles.

European Hornbeam, *Carpinus betulus*. This tree is found in Persia and in Europe. It makes a slow growth but attains a height of 60 ft. The leaves are thicker than *C. caroliniana* with the veins more deeply impressed. The other differences are: In *C. betulus* the buds are 5 mm. long and smooth and the fruit bracts are three to five nerved, whereas in *C. caroliniana* the buds are 3 mm. long and hairy and the fruit bracts are five to seven nerved. The European Hornbeam is superior for hedges as it retains its foliage through the Winter, and being of slower growth, is more compact and stands clipping better. If they were easier to transplant they would be more commonly used as they are ideal hedges. It is advisable to root prune the plants frequently.

Propagation

Seeds. Mix the seeds with moist sand and keep in pots for one year because they germinate very unevenly, or sow in the Fall as soon as ripe and some of them will germinate in the Spring.

Grafting. Oakleaf sorts are grafted on seedlings of the American Hornbeam.

CARYA (See Hicoria, page 245)

CASTANEA—Chestnut

(Kas-tay′-ne-a or kas-ta′-ne-a. The ancient Latin name for Chestnut named from Castanea, a town in Thessaly.)

The Chestnut has been a very important tree for its timber and also the delicious nuts, but in many sections of the country it has been entirely wiped out by the attacks of the Bark Disease.

Botanical Characteristics. The Winter buds have three or four scales and the twigs do not have a terminal bud. The leaves are elliptical, coarsely toothed; the veins are prominent and perfectly straight. The long pendulous male flowers are greenish-white, whereas the female flowers are inconspicuous and are produced at the base of the catkins. There are from seven to nine nuts, usually less, produced within an exceedingly prickly bur.

Species

American Chestnut, *Castanea dentata* (*americana*). Chestnuts are found growing from southern Maine to Michigan, south to Alabama and Mississippi. They thrive in regions 2 and 4. In the forest the trunks are tall and slender, covered by rough bark. The twigs are smooth and resemble the Oak in appearance and also in the characteristic of having a star-shaped pith, but the Oak differs in having the buds clustered at the ends of the twigs. The leaves taper at both ends and are tough, coarsely toothed. All who have gathered Chestnuts will recall the needlelike prickles with which the burs are furnished. They seem to enter our hands even when we use the utmost care in removing the half ripe nuts; of course, the ripe ones fall from the burs and it is unnecessary to free them from their porcupine coats. The wood, which is durable in the soil, has been used extensively for rails, fence posts and cheap furniture. Such trees as have been badly injured by the bark disease often sprout up freely from the roots as few trees are so ready to restore their tops when the tree is cut down.

Japanese Chestnut, *Castanea crenata* (*japonica*). Similar to the native Chestnut, but the leaves are smaller and blunt at the base or even slightly heart-shaped, finely toothed, or with teeth that are little more than bristles, and downy beneath when young. The nuts are very large.

Spanish Chestnut, *Castanea sativa* (*vesca*). Also called Sweet C., the Eurasian C., and Marron C. Like the Japanese species, this Chestnut has downy leaves when young; the burs and the nuts are over 1 in. across. The leaves are slightly rounded at the base. This is a handsome tree for the lawn, vigorous in growth and with a rounded head. Never plant this where there is a cold, clay subsoil.

Propagation

Seeds. Sow the Chestnuts as soon as ripe in flats covered with wire screens to protect them from squirrels and rats, or store them in a safe place in sand and sow in the Spring.

Here the Casuarina, or Beefwood, is trimmed formally and used as a street tree in California

Grafting. Grafting Chestnuts makes them fruit earlier, but it is difficult to accomplish. Meehan suggests grafting when the trees are about to burst into leaf. Seedlings are grafted by the whip or tongue graft. In ancient times the Chestnut has been propagated on the Oak. The Japanese Chestnut may be grafted upon the American Chestnut.

CASUARINA—Beefwood (She-oak, Australian-pine)

(Kas-eu-a-ry′-na. Name said to be derived from *Casuarius*, the Cassowary from the resemblance of the branches to the feathers of that bird.

Casuarinas are trees with long, drooping, green and wiry scalelike structures instead of leaves. They are natives of Asia, Australia, and Polynesia, and are grown in California for the unusual so-called foliage. They are not related to other plants closely, although their botanical structure would place them near Walnuts. The red color of the wood gives the name Beefwood to these plants.

Horsetail-tree, *Casuarina equisetifolia*, is tender to the cold and grown only in Southern Florida and Southern California. The branches are weak, although this becomes a lofty tree with a large trunk. It is a native of the East Indies and the South Sea Islands. It produces a conelike fruit. In regions not perfectly adapted to these plants, it may be wise to set them in warm situations in dry, sandy, alkaline soils, where they are sheltered by tall evergreens at the rear.

Australian Beefwood, *Casuarina cunninghamiana*, is recommended for regions 5, 31 and 32. It prefers light soils and is recommended for the sand dunes near the ocean, where it succeeds under even alkaline and saline conditions.

Propagation

Seeds. Sow in Spring and cover ⅛ in. deep.

Cuttings. These may be placed in coldframes in the Fall and potted in the Spring after rooting.

CATALPA

(Ka-tal′-pa. The word Catalpa is a corruption of the name Catawba, an Indian tribe living in Georgia and the Carolinas.)

The Catalpas are known for their large leaves, the showy masses of bloom and for their use as fence posts.

Botanical Characteristics. The leaves are opposite or else whorled, generally entire, and have a distinct odor when crushed. The flowers are commonly white but also yellow and pinkish, two-

lipped, bell-shaped. The capsules are long, cylindrical and open to form two halves. The seeds have a tuft of hairs at each end and are flat.

SPECIES

Common Catalpa, *Catalpa bignonioides* (*catalpa*) (*syringifolia*). Also called Eastern Catalpa, Indianbean, and Cigartree. This is a tree with a broad, round head and wide spreading branches. It is a native of Georgia to Florida and Mississippi, north to Tennessee. It is usually below 45 ft. tall but rarely 60 ft. The bark is light brown, separating into thin scales. The twigs are furnished with large leaf scars in which there is a ring of bundle scars, depressed into a hollow. The flowers are white with two yellow stripes and spotted with purple-brown. They are produced from June to July in broad pyramidal panicles, 6 to 8 in. high. The oval leaves are often whorled, 4 to 8 in. long, abruptly pointed. The slender, long cylindrical fruits are sometimes as long as 16 in. The wood takes a good polish but has little commercial use, except for fence posts and poles. It prefers shaded places to those in the open. The soil should be moist and fertile. Variety *nana*, the Umbrella C., commonly and incorrectly called *bungei*, forms a dwarf bush and is not known to flower. I saw it effectively used near a Japanese pool at Ponca City, Oklahoma. It was a plant without a trunk but produced a shrubby growth branching freely from the soil.

Western Catalpa, *C. speciosa* (*cordifolia*). A native of southern Illinois and Indiana to western Tennessee and northern Arkansas, it is more vigorous, hardier, earlier, and larger flowered than the Common Catalpa. The tree grows 90 ft. tall. The bark is red-brown. The white flowers have two yellow stripes and are spotted with purple-brown, produced in June, in panicles 6 in. long of but few flowers. The leaves are oval, 6 to 12 in. long, long-pointed. The fruits are 8 to 13 in. long.

Japanese Catalpa, *C. kaempferi* (*ovata*) (*henryi*). This is the hardiest species and one frequently cultivated in Japan, although it is a native of China. It makes a rapid spreading growth, attaining a height of 20 to 30 ft. The flowers are cream or yellow with orange stripes in the throat, spotted violet, slightly fragrant, rather small, in panicles 4 to 7 in. long. The leaves are glossy, small, dark green when mature but purplish and hairy when young, sometimes three- to 5-lobed, broadly heart-shaped, abruptly pointed, with red spots in the axils of the veins beneath. It has been rarely cultivated.

The true *Catalpa bungei* or Manchurian Catalpa, according to Rehder, is a native of North China and has narrow, dark, long-pointed

The flowers of Catalpa speciosa are larger and earlier than the other sorts

leaves; and small, yellowish flowers. It has not proven perfectly hardy at the Arnold Aboretum, has not flowered and is not considered an ornamental tree.

Teas Hybrid Catalpa is a hybrid between *C. bignonioides* and *C. kaempferi* and is intermediate between its parents. The leaves are larger than *C. kaempferi*, hairy beneath, purplish when unfolding; the flowers are smaller and the clusters are twice as long as *C. bignonioides*.

Uses. About half a century ago the Catalpa was widely exploited as the ideal tree to grow for use as fence posts, but they placed too great

faith in the universal use of these trees. Although the wood has remarkable lasting quality in soil and water, yet it is too soft to be used as railway ties.

The so-called Bungei of nurseries, properly called *C. bignonioides, nana* has been largely grafted upon tall stems and used for so called formal effects. Admirers of these trees use them for entrance plantings, regularly spaced specimens, and as the sole tree for a small yard. Those persons who do not like their too formal effect, characterize them as "vegetable feather dusters."

When used for ornament, the Western Catalpa is practically the only one planted, as it is more vigorous in growth and earlier to bloom.

PROPAGATION

Seeds. Sow in early Spring after stratifying during Winter or storing so that they will not dry.

Grafting. *Catalpa bignonioides* and *C. speciosa* are used as stocks for the Umbrella Catalpa, incorrectly called *bungei*. The scions are inserted at a height of 6 ft. early in May or budded when the bark peels, which is usually August. The grafting wood should have been gathered in the Spring and placed in cold storage to keep perfectly dormant. Cleft grafts are used.

Cuttings. Hardwood cuttings root rather easily.

CEDRELA (Toona)—Cedrela

(See-drel'-a From *Cedrus*, the Cedar, because the wood resembles Cedar.)

The Cedrelas are trees sometimes used for street planting, but several species have wood which is beautiful in color and valued for boxes and furniture. Although the Cedrela resembles the Ailanthus, it does not sucker so badly nor are the flowers of a bad odor.

BOTANICAL CHARACTERISTICS. The leaves are compound, the leaflets are petioled. The flowers are white, small, produced in large clusters. The fruit is a leathery capsule bearing winged seeds within.

COMPARISONS. The large foliage, which resembles the Ailanthus, differs in the absence of large, gland-bearing teeth at the base of the leaflets.

Chinese Cedrela, *Cedrela sinensis*. The trees are wide topped, attain a height of 45 ft. It is hardy in Philadelphia, but in the climate of Massachusetts it sometimes dies to the ground. The bark is loose and shredding. The flowers are white or greenish, slightly fragrant, small, in pendulous panicles 12 in. long, produced in June. The foliage is alternate, long-petioled, 10 to 20 in. long; there are 10 to 22 leaflets,

The Cedrela, resembling the Ailanthus, is not as hardy

each being 3 to 6 in. long, sharp-pointed, remotely toothed, especially at the apex.

PROPAGATION

Seeds. They grow readily.

Cuttings. Root cuttings are successful, although the trunks may not be straight, in which case cut the growth down to the ground. Greenwood cuttings may be rooted with bottom heat.

CELTIS—Hackberry

(Sel′-tis. Celtis is the ancient Greek name of some tree which bore sweet fruit.)

Related to the Elm, the Hackberry resembles it in foliage and twig characteristics. As a city tree it is freer from pests than the Elm and is very tolerant of city conditions.

Hackberry, *Celtis occidentalis*. Also called Sugarberry, Nettle-tree, Hoop-ash, False-elm, Niggerpill, and Hacktree. This is a native tree found from Nova Scotia to Puget Sound, south to Florida, Missouri, Texas and New Mexico. Grows in regions 11-16, 19, 20, 21, 22, 23. The tree attains a height of 120 ft. The twigs are smooth, somewhat zigzag, with a chambered pith. The flowers are not showy. The leaves are ovate to oblong ovate, sharply toothed, lop-sided, 2 to 5 in. long, sharp-pointed. The fruit is smaller than a pea, orange to dark purple with scanty flesh. One can take a handful of the fruits in his mouth and chew on them for their sweet flavor, but the flesh is so scanty that there is really little to eat. The wood is used for fences and cheap furniture. This tree likes a rich, moist soil.

Sugarberry, *Celtis mississippiensis* (*laevigata*). This species grows from southern Indiana and Illinois to Texas and Florida. The trees grow 90 ft. tall. The light grey bark is covered with corky warts. The leaves are not toothed, as in *C. occidentalis*. This sort is grown in the South as a street tree. The branches are rather pendulous.

Propagation

Seeds. Sow the seed as soon as ripe or store carefully and sow in early Spring. The birds carry the seeds long distances.

CERATONIA—Carob (St. Johnsbread)

(Ser-a-toh′-ni-a. From *Keras*, meaning horn, in reference to the seed pods.)

This tree is especially interesting because it is supposed to be the Locust of the Bible, and the seeds are the Locusts which St. John the Baptist ate. The seed pod is filled with sugary pulp which is the "wild honey." The husks are supposed to be the husks which were fed to the Prodigal Son. Even today many persons who grow this tree like to eat the pods for their sugary flavor, and the seeds are eaten freely by horses. The seeds are supposed to be the standard for the carat weight of jewelers.

Carob, *Ceratonia siliqua*. In England it is known as St. Johnsbread and Sows-bread. The trees are found in Southern Europe, especially Spain, which indicates that it thrives only in the warm regions where Oranges grow. It is adapted to regions 5 and 10. The trees grow 40 ft. tall. The flowers are red and yellow and are not showy, as they have no petals. Inasmuch as many of the trees bear only one sex, one cannot expect an individual tree to be fruitful. However,

some trees have flowers bearing both stamens and pistils, and these bear when only specimen trees are used. The foliage is pinnate, shining dark green, and papery in texture. They tolerate very dry soil but enjoy a rich, porous soil; they do not succeed in stiff clays. They are difficult to transplant and must be moved with a ball of earth.

PROPAGATION

Seeds should be soaked in water for several days. Sow in pots so as to avoid disturbing the roots in transplanting.

Cuttings of ripe shoots may be made and rooted in sand.

CERCIDIPHYLLUM—Katsura-tree

(Sur-sid-i-fil′-lum. From *Cercis,* the Redbud and *phyllum,* a leaf; so called because the leaves resemble those of the Redbud.)

This is a tree which in its youth is quite shrubby, branching freely from the soil.

BOTANICAL CHARACTERISTICS. The leaves are opposite, heart-shaped, broadly ovate, palmately veined, with rounded teeth. The flowers are inconspicuous, appearing before the leaves.

Cercidiphyllum japonicum. This is usually considered a shrub when young, but with age it becomes at least 20 ft. tall and in its native home, Japan, it grows 100 ft. tall. It is hardy in the Northern States. The flowers are of one sex on a plant, but coming in early April, they are not conspicuous. The leaves are heart-shaped and are produced in a unique way. Apgar explains that the new leaves come from the place where the old leaves dropped off. In other words, the new leaves are found not only on new growth but also on wood which is more than a year old. The leaves are deep green above and silvery green beneath, with the leaf stalks and veins often red. With the approach of Fall the leaves turn to lovely purplish-red and yellow. The coloration varies greatly and it is often suggested that root pruning will induce brilliant coloration. The Cercidiphyllum likes a deep rich, perhaps slightly damp rather than a dry soil. If any objections may be made it is that the trees are a trifle too regular, as though they had been sheared. They are rather difficult to transplant. Francis Canning notes: "I think the female tree much the handsomer of the two forms; it is more spreading, the male being columnar." The leaves are opposite, whereas those of the Cercis are alternate.

PROPAGATION

Seeds. The trees are either male or female. Both are necessary for seed production. The seeds are usually obtained from Japan, and should be kept moist until sown.

The Katsura-tree, Cercidiphyllum, is one of the loveliest of shrubby trees because of the sprays of clean leaves

Cuttings. Some nurserymen grow plants in the greenhouse and take softwood cuttings in early Spring, and it is said that these should be allowed to wilt a little before inserting in the sand.

Layers. Old plants may be cut back in early Spring, and after a new growth has been forced, they may be layered in a sandy soil.

CERCIS—Redbud, Judas-tree

(Sur′-cis. The ancient Greek name is Kerkis, a shuttlecock, the name given it by Theophrastus.)

Botanical Characteristics. The trees form broad, round heads. The leaves are alternate and palmately veined. The flowers are pealike and the fruits are like thin pea pods.

Redbud, *Cercis canadensis*. Also called Junebud. A large shrub or a tree often 36 ft. tall, which is inclined to have horizontal branches as the tree ages. It thrives in regions 1, 2, 4, 6, 7, 16, 20, 22-25, 27-29. The flower buds are inclined to be produced upon the old wood, even upon the trunks of the tree. The buds are usually in clusters one above another. The pith of the twigs has red streaks and the wood is generally blotched and veined black, green, and yellow. The rosy purple flowers are produced before the leaves in April. The leaves are broadly ovate, 3 to 5 in. across, deeply heart-shaped, abruptly pointed. The seed pods are flat, narrowly oblong. These picturesque trees are best

The lovely American tree, the Redbud, is most welcome in the early Spring woods

planted where they have a heavy background so that the flowers may be seen to advantage. "An ideal combination," says R. R. Rothacker, "is with American Larch." The French-Canadians used the flowers in salads and pickles. It is said that the flower buds fried with fritters are quite acid. It seems best to transplant these trees while they are still young as they move with difficulty when they become older. Variety *alba* is a white variety seen to advantage in Highland Park, Rochester.

Chinese Redbud, *Cercis chinensis* (*japonica*). A native of southern China, this species is also shrubby but attains a height of 45 ft. in cultivation. The flowers are rosy-purple, darker than *C. canadensis* and therefore more desirable. It is in bloom with the Magnolias and the Flowering Dogwood. In foliage it differs from the other sorts by having a whitish, transparent line around the margin.

True Judas-tree, *Cercis siliquastrum*. Also called Lovetree because of its heart-shaped leaves. This species has been cultivated since ancient times, but it came from Southern Europe and Western Asia. It attains a height of 30 ft. and has a flat top. The flowers are also rose-purple. The leaves are suborbicular, but are not pointed, as in *C. canadensis*. In moist places the tree is said to bloom not only in early Spring but also in the Fall.

Propagation

Seeds. Soak the seed in hot water before sowing. Do not sow until after soil is warm. The Redbud seeds freely and seedlings are often collected from the wild.

Cuttings. Cuttings are difficult.

CHIONANTHUS—Fringetree (Old-mans-beard)

(Ky-oh-nan′-thus. Name derived from *chion*, snow; and *anthos*, meaning flower.)

The Fringetrees are often considered large shrubs, although it is not uncommon to see them as trees 30 ft. high, especially if they are pruned when young to form a single trunk. Inasmuch as they bloom in June and the whole tree is covered with greenish-white flowers, they have an unusual appearance in the landscape. They are especially effective when they are given a good background of evergreens or other trees which come into leaf early. It is surprising to realize the Fringetree's botanical relationships. It is related to the Ash, and, in fact, it is frequently grafted on the European Flowering Ash, *Fraxinus ornus*.

Botanical Characteristics. The twigs resemble those of the Ash with the exception that the buds are scaly. The leaves are opposite, entire. The flowers are usually of one sex upon a tree. They are white and appear in loose panicles from the lateral buds. The fruit is oval, dark blue, and one seeded.

White Fringetree, *Chionanthus virginica.* Often called Old-mans-beard. The White Fringetree is found from Pennsylvania to Texas. It usually grows only 10 ft. tall, although in favorable locations it attains a height of 30 ft. The flowers are greenish-white, borne in June and July and in great profusion. The plants bloom when only 2 to 3 ft. tall. The flowers have drooping petals and are produced in panicles 5 to 8 in. long. The flowers are generally of one sex only on a plant, those produced on the male plant being more showy. The coarse leaves are opposite, 3 to 8 in. long, varying greatly in width on different plants. The trees come into leaf late in the Spring and turn yellow in the Fall. The fruit ripens in August and is produced in clusters like grapes, although much smaller in size of clusters as well as fruit. The Fringetree is adapted to somewhat shady locations. It is well planted as specimens or for contrast, inasmuch as the leaves are coarse and the flowers are produced abundantly. Old books claimed that this tree was used as a tonic. Its native habitat is a deep, moist, sandy loam. There are several objections to it. It is slow in growth; the flowers are not pure white; and in the Northern States it sometimes is a little tender.

Chinese Fringetree, *Chionanthus retusa.* This species blooms one week later and is almost as handsome as the White Fringetree. The leaves are more oval.

Propagation

Seeds. Mix the seed with damp soil and sow in boxes. It takes one year to germinate.

Grafting. This may be grafted upon the Ash, especially *Fraxinus ornus*, and the plants should be set deeply so that they may grow on their own roots, as the Ash starts Spring growth too slowly.

Layers. As the Fringetrees are often quite shrubby, it is frequently possible to layer them.

CINNAMOMUM—Camphor-tree, Cinnamon

(Sin-na-moh′-mum. From its ancient Greek name, Kinamon.)

The Cinnamon-tree is *Cinnamomum zeylanicum* and is cultivated frequently in the Tropics for its bark, which is used for flavoring.

The Camphor tree, *Cinnamomum camphora*, is a native of Japan, and in the East Indies, where it grows to a 40 ft. height. It is found commonly cultivated in all of the warmer regions of the world, where its odoriferous, shiny leaves are greatly admired.

In the United States Camphor trees are easily grown in regions 30, 31 and 32. The trees have an oval head and an enlarged trunk at the base. The twigs and leaves when crushed have a marked camphor odor. The buds are inclosed by round scales. The leaves are alternate, with long stems, oval, sharp-pointed, 2 to 5 in. long, pinkish when young, greenish above and grayish-white beneath. The flowers are yellow. The fruit is a berry, $\frac{1}{4}$ in. in diameter. The wood is white. This is the

The Yellow-wood is related to the Locust, bearing numerous pea-like pods (See text on opposite page)

tree from which camphor is manufactured by splitting the wood into small pieces and distilling it.

Loudon says that in former years the camphor was derived by covering an earthern or wooden pot in the hollow of which straw was placed. The camphor adheres as it rises with the steam of the water. At first it is brownish-white but is later redistilled and becomes white, as we see it in the shops.

The Camphor-tree is recommended as one of the most interesting trees of Southern Florida and California planting. The trees prefer a sandy loam.

Propagation

Seeds. Wash the pulp from the seeds as soon as ripe and sow in the Fall. When the seeds are imported, they should be sown as soon as they arrive. In Florida they self-sow freely beneath the mature specimens. They are difficult to transplant and should be kept in pots from the start.

CLADRASTIS (Virgilia)—Yellow-wood (Gopherwood)

(Kla-dras′-tis. From the Greek *Klados*, branch and *thraustos*, fragile, referring to the brittle twigs.) (Virgilia is named for the poet Virgil.)

Yellow-wood (Cladrastis)

Yellow-wood, *Cladrastis lutea (tinctoria)*, is found wild from North Carolina to Kentucky and Tennessee. It forms a broad, round head, and becomes 45 ft. tall. The bark, which resembles the Beech, is a smooth yellow. The twigs are zigzag. The buds are covered by the base of the petiole. The fragrant flowers, which bloom when most others are through, appear in panicled racemes over a foot long, and are white, rarely pinkish. The leaves are alternate and are seven- to nine parted. They turn yellow in the Fall. The fruit has a thin pod. It is useful in open places, and yellow dye is obtained from its wood. It prefers a loose, deep, fertile soil. The roots go very deep into the soil, making the tree drought resistant. The deep rooting makes it necessary for the roots to be pruned in the nursery so that transplanting will not be difficult. Shape up the head when the tree is young so that too many branches do not start. Persistent leaf stalks are a little unsightly in the Winter.

Propagation

Seeds. The seeds grow readily but they are sparsely produced.

Root cuttings. The roots may be dug in the early Winter, cut into 3 in. lengths, and kept in a cool place in damp moss or sand.

If greenhouses are available the cuttings may be started in pots or planted in the open ground in early Spring.

Layers. Young plants may be layered.

CORNUS (Benthamia) (Cynoxylum)—Dogwood

(Kor'-nus. From *cornu,* a horn. The wood is thought to be as hard and durable as a horn. The name Dogwood has been given several derivations. One origin is that Dogwood is a form of Swedish word for dagger wood, because some species were used for making daggers. Parkinson in his "Paradisus in Sole Terrestris" says that the fruit in most of the species is not fit for a dog to eat. It is thus a term of derision. Perhaps the most likely derivation, however, is from the use of the bark for making a concoction used as a wash to cure mange in dogs.)

The Dogwoods are well known in the United States, where the Flowering Dogwood takes its place as being without an equal among the showy early Spring flowering trees. Europeans often say that there are few trees in America which they envy as greatly as our Flowering Dogwoods. There are scores of species of Dogwoods, which we cannot discuss in this book because they are shrubs. With the exception of two species, *Cornus alternifolia* and *C. controversa*, all the species have opposite leaves.

Botanical Characteristics. The Winter buds are long with two scales which fit like the two halves of a clam shell. The leaves are opposite, rarely alternate. The flowers are usually produced in terminal cymes or heads, which are surrounded by large bracts. The fruits are one-seeded.

Pagoda Dogwood, *Cornus alternifolia.* Also called Green-osier, Pigeonberry, and Alternate-leaf Dogwood. This is a shrub or small tree, attaining a height of 20 to 30 ft. The branches are in irregular whorls, forming flat, horizontal tiers. Twigs green or reddish-brown. The panicles of creamy-white flowers appear the first part of May. The leaves are slender stalked, usually crowded at the ends of the branches. They are smooth above and gray beneath. The Pagoda Dogwood differs from most Dogwoods in that the leaves are alternate. The twigs are smooth and green. The blue-black fruit is borne on red pedicels in July and August. Some birds eat the fruits. The Pagoda Dogwood prefers a damp soil and partial shade. It was a famous remedy in the American colonies. (See also *C. controversa.*)

Giant Dogwood, *Cornus controversa.* This Dogwood is a native of western China. In habit it resembles the Pagoda Dogwood, *Cornus alternifolia.* It has broader flower clusters and blooms a week or ten days earlier than the Pagoda Dogwood. It makes a vigorous growth, and attains a height of 60 ft. in its native habitat. It is perfectly hardy.

The snowy bracts of lovely Flowering Dogwood surround tiny yellow flowers

The flowers are white, produced in May or June. The leaves are alternate, unlike most Dogwoods, and are borne on reddish stems, with six to nine pairs of veins, and usually rounded at the base. See *Cornus alternifolia* for difference in leaves. The branches are in tiers so that this tree produces a splendid effect in the landscape with its more or less horizontal branches. This Dogwood is very rare in American gardens at the present time but is frequently seen in botanical gardens.

Flowering Dogwood, *Cornus florida.* No other Dogwood is as widely known as the Flowering Dogwood, being a native of the woods from Massachusetts to Florida, west to Ontario, and Texas. The trees produce a low, spreading head, with the branches in tiers and therefore horizontal. The bark cracks into four-sided or rounded

plates, becoming checkered, not unlike an alligator skin. In Winter the buttonlike buds are prominent at tips of greenish twigs. The usual height of the trees is 15 ft. although they are rarely seen at a height of 36 ft. The tiny yellow-clustered flowers, which are borne in May, are surrounded by four large white bracts. In this case it is the bracts which many people call the flowers of the tree. Each of these bracts is deeply notched because it has been the bracts which have served as the bud scales throughout the Winter, and the exposed portion of these flower bud scales have been frozen and dried. At the arrival of Spring the bracts grow rapidly, but the part which was exposed to freezing is stunted. The leaves are oval, 3 to 6 in. long, abruptly pointed, broad or rounded at the base, and have six to seven pairs of veins. Few trees turn such glorious scarlets in the Autumn. The fruits ripen in September to October, are red, very showy, and are produced in small clusters. The bark contains some substance which served as a substitute for quinine during the Civil War. The wood is used for hubs of small wheels, wood engraving blocks, handles of tools, and golf stick heads. Flowering Dogwood thrives in low, moist, fertile soils. The Bulletin of the Morton Arboretum says that the Flowering Dogwood is the best on gravelly slopes which are covered with a thick layer of decaying leaves. When planted in rich prairie soil it makes a very strong growth and continues to grow till late Fall, with the consequence that frosts kill all unripened wood. During the next year a still stronger growth is likely to follow and then in the Fall such a severe frost injury that the plant will die within a year. In Europe it is not looked upon as ornamental because it is not considered hardy, although the Winters are more mild than our own. The problem there is to keep the plants dormant during mild spells. This is done by applying a mulch of straw in January, when the temperature is lowest. This retains the frost in the soil. Therefore, in adverse situations, western and northern exposures are best with shade against the early Spring sun.

Kousa Dogwood (Japanese Dogwood), *Cornus kousa* (*Benthamia japonica*). Its native habitat is Japan and Korea, and it grows to be 21 ft. tall. At first it is upright, but with some development the branches spread. Ernest Wilson said that its bud hardiness is greater than that of *Cornus florida*. The twigs are green, becoming brown and slender. The flowers, which are white but turn pink with age, are 1 to 2 in. long. They are produced on slender stalks in dense globose heads which are not as distinct as those of *Cornus florida*. The bracts are pointed, not notched. The leaves are ovate, 2 to 3¾ in. long, pointed, with a wedge-shaped base. They are green above

Note that the white bracts of the Kousa Dogwood are pointed and not notched at the tips

and hairy beneath, with very prominent, depressed, red veins. In the Fall they turn scarlet. The pinkish fruits have seeds imbedded in them. They are edible. The Kousa Dogwood tolerates shade.

Variety *chinensis*, Chinese Dogwood. Leaves may have, or may not have, hairs in axils of leaves. The leaves are larger and more hairy than those of the *Cornus kousa*. The bracts, which overlap, are 2 to 2½ in. long. Ernest Wilson reported that some claim that this plant is the finest gift of China to Western gardens.

Cornelian-cherry, *Cornus mas* (*mascula*). Found native in Austria, Europe, and Western Siberia. It has been cultivated for 300 years and is particularly hardy in Wisconsin. It is a shrub or a small tree, growing 20 ft. tall. The close-textured, scaly, dark brown bark is

firmly adherent to branches for many years and with age becomes rough and flaking in small patches, exposing gray under the surface. The branches are quadrangular and when young are greenish yellow. The branches are completely wreathed with tiny yellow flowers, borne in clusters in axils of unfolding leaves. *Cornus mas* is one of the earliest flowering small trees. The leaves have very short petioles and are oval, sharply pointed at the tip. Often they have short downy hair beneath and are lustrous above. The large scarlet fruits ripen in August and are hidden by the leaves. The name Cornelian-cherry is given because of the beautiful cornelian color of the fruit. Some say that the fruits are good for acid beverages. The tree grows well in the shade and is not particular as to the soil. Few other trees have such a pleasing early Spring effect. It is especially effective used against evergreens. It is a rival of Goldenbell but is more hardy and comes into blossom two or three weeks earlier. The plants may be trained to one trunk. The tree does not make such a good appearance in the nursery, as it grows slowly when young, but the trees are said to live centuries. A variegated form which is frequently seen is called *Elegantissima.*

Pacific Dogwood, *Cornus nuttalli*. This Dogwood is similar to *Cornus florida*. It grows to a height of 75 ft. The white or pink flowers are distinct, not enclosing flower buds in the Winter. The flowers are twice the size of those of the Eastern form. The bracts are not notched and there are usually six, although there are often four or five. In Oregon, *Cornus nuttalli* often blooms the second time in the Fall, especially when in cultivation. The leaves are elliptic to obovate, 3 to 5 in. long, and are short-pointed. When they are young they are hairy on both sides, but as they mature they are usually hairy only beneath. There are five to six pairs of veins. The fruit is bright red or orange. The Pacific Dogwood is not successful in the East but it is good in southern England. For illustration, see page 66.

Cornus officinalis. This tree is said to closely resemble *Cornus mas*. It grows to be 35 ft. tall. It is erect, with a spreading, irregular crown. The bark is reddish-brown, peeling and splitting the second year into transparent papery shreds which cling to the branches. The flowers appear a week earlier than those of *Cornus mas*. In comparison with *Cornus mas*, the petals of the flowers are more narrow and more pointed, the bracts around the flowers are less concave and more sharply pointed, the pedicels are longer, and the sepals are larger and more acute. There are tufts of brownish hairs in the axis of the veins. The fruits are more oblong and are thinner.

Transplanting. Large plants of the various Dogwoods are difficult to transplant, so that when they are collected from the woods, small seedlings should be chosen. Reliable nurserymen dealing in large Dogwoods transplant them frequently and sell them with ball-and-burlap. Large Dogwoods seldom transplant successfully when carelessly dug from the woods. They are subject to a borer which works under the bark until small trees are girdled. Vigorous plants are seldom susceptible to this borer. When they are discovered they should be dug out with a knife before they destroy the plant. The adult is a clear-winged moth, which has the appearance of a bee or wasp.

Propagation

Seeds. Most of the treelike-sorts of Cornus are grown from seed. Seeds of *Cornus kousa* are often infertile. Dr. Opal Davis found that at least 90 per cent of the seeds of the Flowering Dogwood from plants grown alone were infertile. Evidently this Dogwood is self-sterile. That is, it cannot produce good seed unless pollinated by a plant other than itself. Dogwoods growing in clumps had less than 10 per cent of the seeds infertile.

Seeds of *Cornus florida* and *C. kousa* germinate after having been submitted to a temperature of 41 degrees for 120 to 130 days, and *Cornus nuttalli* germinates after having been submitted to a temperature of 41 degrees for 145 to 165 days; *Cornus mas* after being submitted to a temperature of 50 degrees for 120 days, and *Cornus officinalis* after having been submitted to a temperature of 50 degrees for 300 days.

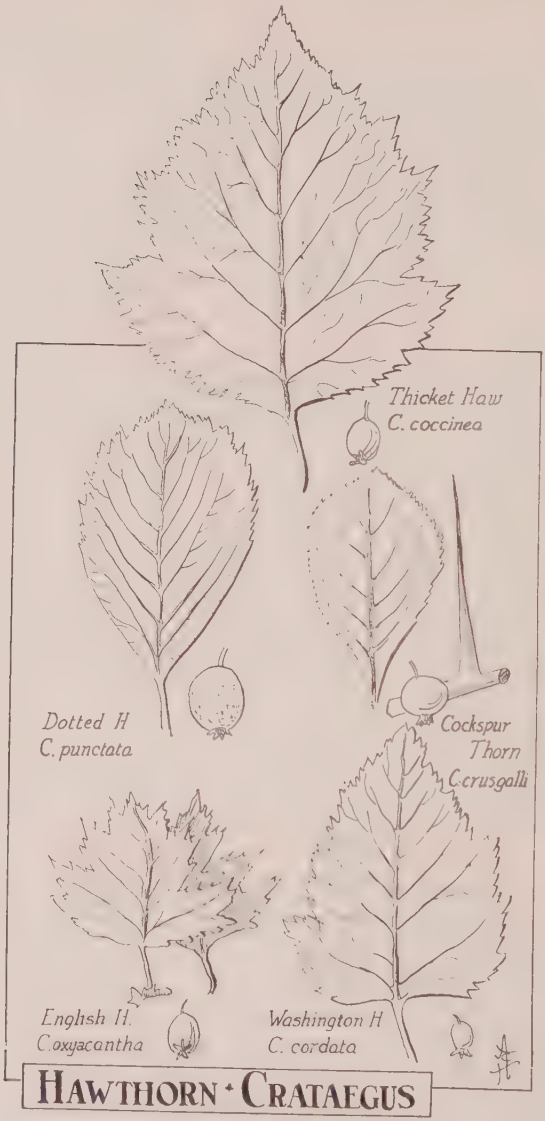
Grafting. The Red Flowering Dogwood and the Weeping Dogwood are grafted in Spring or budded in July on *Cornus florida*, which is grown from seed or collected. *Cornus mas* may be whip grafted on roots in Winter, stored in sand or green sawdust and planted in the Spring.

CRATAEGUS—Hawthorn

(Kra-tee′-gus. From the Greek *kratos,* strength, alluding to the wood.)

The kind of Haws which are found wild in America are almost without number. Some of the most eminent botanists have made a study of them and are still bewildered. For our purpose we need not mention more than a few of the most outstanding sorts. Rehder says that there are 800 known species in North America and 90 in the Old World. In the Arnold Arboretum there are 600 kinds growing.

The gardener's interest in Haws depends upon the fact that even the young plants are dense with small twigs, and shortly the young



A few sorts of Hawthorn will illustrate the great variation in the foliage

trees become horizontal branched. They thereby introduce the horizontal note in our plantings and are worthy subjects of lawns as specimens and to harmonize a shrubbery into a naturalistic landscape.

Botanical Characteristics. Haws are usually spiny branched, with alternate leaves, various in shape, sometimes almost entire but generally deeply toothed or even lobed. The flowers are white, produced in corymbs, rarely solitary. The flowers are sometimes delightfully fragrant, but more often they have a strong odor, reminding one of the fishing smacks of Massachusetts. The fruits of some species are edible and are like small apples.

Washington Hawthorn, *Crataegus cordata* (*phaenopyrum*). This is native from Virginia to Alabama and Missouri, and grows to be 30 ft. tall. The foliage is dense and forms a round head. The slender spines are 3 in. long. The large corymbs do not form until late in the season. The broad, triangular leaves are 1 to 3 in. long and are pointed, blunt, or even slightly notched at the tip. They are three- to five-lobed and are sharply toothed. During the Summer they are lustrous, turning scarlet or orange in the Fall. The shining scarlet fruits are depressed and globose. The branches are very brittle so that they break easily in the wind. This is one of the best fruited sorts, producing a profusion which hang on the branches for a long time.

Cockspur Thorn (Newcastle Thorn), *Crataegus crus-galli*. It grows from Quebec to North Carolina and west to Michigan. Recommended for regions, 1, 2, 6, 7, 8, 16, 19, 20, 22-29. It reaches a height of 36 ft., spreading its rigid branches widely. The bark is greyish to reddish-brown. It has many long, slender thorns. The flowers are very attractive, and the buds are small. The leaves are obovate to oblong-obovate and are rounded at the tip, with a wedge-shaped base. They are 1 to 3 in. long and are sharply toothed above the entire base. They turn red and orange in the Fall. The red fruit has a thin, dry flesh and is attractive during the Winter. *Crataegus crus-galli* prefers sandy or gravelly soil. It is used as a hedge and makes very good fuel and fence posts.

Crataegus lavallei (*carrierei*) (? *crus-galli*×*pubescens*). This tree grows to be 21 ft. high and is rather spreading. Its stout spines are 2 in. long. The twigs are hairy. The white or red flowers are disklike and are hairy. The leaves are oval, oblong obovate, or wedge-shaped, 2 to 4 in. long, and have a pointed tip. They are unequally toothed below the middle. They are lustrous, and in the Fall turn red or orange, remaining on the tree until very late.

Downy Hawthorn, *Crataegus mollis*. This is a small tree 30 ft tall, found wild from Ohio to South Dakota and Kansas. The flowers

The double buttonlike flowers of the Paul Scarlet Hawthorn are popular wherever flowering trees are planted

are large and white with a red disk. The broad ovate leaves are 2½ to 4 in. long, sharply and doubly toothed, with four to five pairs of short, pointed lobes. When the leaves are young they are densely hairy beneath, but when they are older they are chiefly hairy on the veins. The tree has short, stout thorns. The pear-shaped fruit is scarlet, hairy, and is sweet and mealy. In 1923 it was selected the state flower of Missouri.

English Hawthorn, *Crataegus monogyna*. Grows to a height of 30 ft. This Hawthorn is similar to *Crataegus oxyacantha*. However, there are 3 to 7 lobes, which are deeper and more narrow, with only a few teeth at the apex. The scarlet fruit has one stone.

Glossy Hawthorn, *Crataegus nitida*. This tree is found in the bottom lands of the Mississippi River. It is spreading, broad, open

The horizontal branches are characteristic of the Dotted Hawthorn, *Crataegus punctata*

and unsymmetrical, and grows to be 30 ft. tall. The leaves are elliptic, very sharp, wedge-shaped at the base, and are 1 to 3 in. long. They are lustrous, changing to orange and scarlet in the Fall, and coarsely serrate, often slightly lobed. It is either thornless or bears straight thorns. The dull red fruit has a yellow flesh. The tree is found in great profusion throughout the West.

English Hawthorn, *Crataegus oxyacantha*. This is the May of English literature. It is found wild in Europe and North Africa, and is a very small tree, growing only 15 ft. tall. It has stout spines about 1 in. long. The broad, triangular leaves, which are 3/4 to 2 in. long, are wedge-shaped at the base and have three to five broad lobes. The fruit is scarlet and has two stones. See *C. monogyna* above.

Varieties.

Crataegus puniceu has dark red flowers.

Crataegus rosea has light red or rose flowers.

Crataegus paulii has bright scarlet double flowers. Also known as the Paul Double Scarlet Hawthorn. *C. monogyna flore pleno* and *C. splendens*.

Crataegus plena has double white flowers, which are a good contrast with the other varieties.

Dotted Hawthorn, *Crataegus punctata*. Grows to a height of 30 ft. The branches are horizontal and present a close, compact growth. If there are spines they are stout and short. The twigs are hairy. It flowers in late May and June. The leaves are 2 to 4 in. long and are narrowed at the base into a margined petiole. They are irregularly toothed and are often lobed above the middle. They are hairy beneath and have impressed veins. The dull red fruit is dotted, hence the name *punctata*. The fruit appears in October and is soon gone. This Hawthorn is used mainly as shubbery and for hedges. The Indians made wedges of it to split logs.

PROPAGATION

Seeds. The Boyce Thompson Institute found that Crataegus seeds are frequently infested with chalcidoid flies, and in one lot of seeds they found 75 per cent contained larvae and 10 per cent were without embryo. This would leave 15 per cent as the greatest possible per cent of germination. *Crataegus oxyacantha* is the one which they studied, and they found that it germinates when submitted to a temperature between 41 and 50 degrees for 365 days. Most of the Hawthorns are grown from seed, as they are true species. Meehan says that *Crataegus tomentosa* when sown in the Fall germinates in the Spring and is an exception.

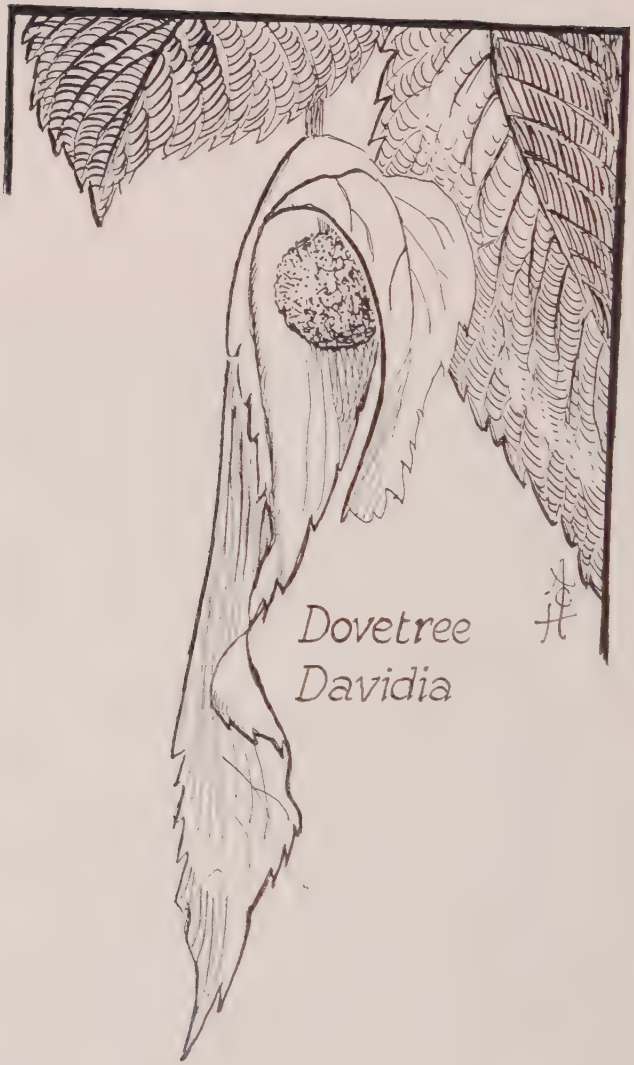
Grafting. The Paul English Hawthorn, the Paul Double Scarlet Hawthorn, and the Double English Hawthorn are budded in July on seedlings of *C. oxyacantha*.

DAVIDIA—Dovetree

(Day-vid′-ia. Named for Armand David, a French missionary who botanized China 1862-1873.)

The Dovetree, *Davidia involucrata*. It is found native to Western China. It attains a height of 60 ft. This tree is straight, with ascend-

The beautiful foliage of the Dovetree, Davidia, serves to make the tree worthy of culture, even if it were not for its unusual flowers shown in the illustration on the following page



Note the unusual flowers which consist of a ball of creamy white surrounded by two large bracts often six inches long

ing branches and an open growth. Rehder says that it has the aspect of a Linden. It is tender only when young. The creamy-white flowers are borne in dense heads, which have two large bracts at their base over 6 in. long. The broad, heart-shaped leaves have a very sharp tip. They are 3 to 5½ in. long and are opposite. Their margins are sharp toothed and they are strongly veined and have dense, silky hair beneath. The pear-shaped fruit has a stone with three to five seeds, and is green with a purple bloom.

Variety *vilmoriniana*. The leaves are smooth beneath or else very slightly hairy when young. It is more commonly grown than *Davidia involucrata*

PROPAGATION

Seeds. Sow the seeds in the Spring.

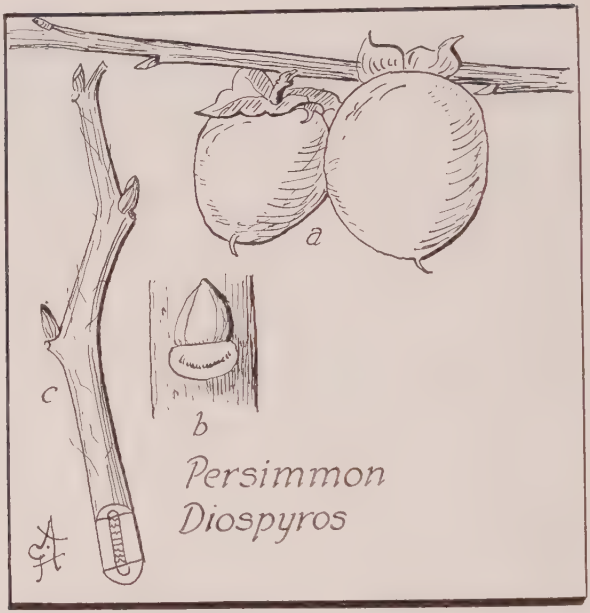
Cuttings. Often soft wood cuttings may be rooted in the Summer under glass.

DIOSPYROS—Persimmon (Date-plum, Possumplum, Joves-fruit)

(Dy-os'-pir-os. From *Dios*, jove, and *pyros*, grain; referring to the edible fruit.)

The Persimmon, *Diospyros virginiana*, is found wild from Connecticut to Florida and west to Kansas and Texas. It grows to 45, rarely 60, ft. high. The bark is dark and is often divided into square, thick plates. The heart wood is black. The twigs are slender and greyish to reddish-brown and are pale hairy. They have a large pith or pitch chamber. The heart wood of the twigs is also black. The leaves, which are 2½ to 5½ in. long, are ovate to elliptic and are rounded at the base. Above they are lustrous but beneath they are paler. In the Fall they turn an orange-red. The edible, round fruit is 1¼ in. across, yellow or pale orange with a red cheek. The fruit has one to ten seeds. Before the fruit can be eaten it must be frozen, inasmuch as freezing destroys the natural astringency. The tree prefers light, sandy and well-drained soil. The wood is used to make billiard cues, shuttles, wallets, brush backs, veneer and shoe lasts. When the old branches become too thick they drop off in the Spring. It suckers very readily.

Ebony, *Diospyros ebenum*. The name is derived from the Hebrew *eben*, a stone, alluding to hardness of wood. Ebony is raised mainly in Ceylon. After it has been immersed in water for 6 to 18 months



a, the fruit; b, the bud with its leaf scar bearing the bundle scars in a long, curved line; c, the zigzag twig showing the spongy or chambered pith

to prevent checking and splitting, it is used for wind instruments, veneer, inlaying, piano keys, nuts, fingerboards, and tailpieces of violins.

Japan Persimmon, *Diospyros kaki.* A valuable fruit for the entire South even to southern Florida, and since the discoveries regarding pollination of the flowers, it is far more desirable to plant for both home use and for the market. The fruits are orange or reddish. See Bailey's "The Standard Cyclopedia of Horticulture," pages 2557-2560, for a discussion of culture and varieties.

Propagation

Seeds. Sow the seeds as soon as ripe or stratify it until Spring. See table on page 140. The trees usually bear only one sex, so that the fruit production is encouraged by planting a clump of trees.

Grafting. The practice of grafting common Persimmons is resorted to only in order to get both sexes on one tree, but the superior named varieties may be grafted on *Diospyros virginiana.*

EHRETIA—Tallow-tree

(Eh-ree'-shia. Named for G. D. Ehret, a German botanical artist.)

Ehretia thyrsiflora. This tree is found native in Southern Japan and Eastern China. Usually it is 12 to 15 ft. tall, but in China it is 75 ft. tall. It has spreading branches. The bark is fissured and fibrous. The twigs are a polished yellow-green. The white flowers have an unpleasant odor; they are borne in terminal panicles 4 to 6 in. long, resembling those of the Privet. The leaves are oblong to ovate, 3 to 5 in. long, and are sharply toothed. The small, shotlike fruit is not ornamental. It suckers very easily.

PROPAGATION

Suckers. As these plants sucker freely, they are propagated by this method and also by root cuttings.

ELAEAGNUS—Russian-olive (Oleaster)

(El-ee-ag'-nus. Dioscorides named the Wild Olive, *Elaeagnos.*)

Russian-olive, *Elaeagnus angustifolia* (*hortensis*). It is really tree-like, attaining a height of 20 ft. Hardy in the extreme North, growing from regions 1 to 28. The branches are brown and smooth, with a few spines. The flowers are pale yellow, although small and insignificant they are very fragrant; they open in June and perfume the air. The leaves are grayish. The twigs have star-shaped hairs of a grayish color. The leaves are whitish green, 2 to 3 in. long, and narrow. The fruit is yellowish and also covered with silvery scales; it ripens in August and is sweet and mealy. The silvery whiteness of the foliage renders this tree a very attractive subject in the landscape, and wherever a gray foliage is desirable, this tree can be used, as we have already alluded to its adaptation to all parts of the country. It is frequently used as a background for darker shrubs, as well as those which produce flowers abundantly.

PROPAGATION

Seeds. Sow them when ripe or store them in damp soil and sow in October. They usually do not germinate until the second year.

Cuttings. The Russian-olive is easy to raise from hardwood cuttings.

NURSERY grown trees have fibrous and well balanced root systems so that they transplant better than those gathered in a woods.

EUCALYPTUS—Australian Gum

(Eu-ka-lip′-tus. Name derived from *eu*, well; and *kaluptos*, to cover as with a lid. It refers to the calyx, which covers the flower before expansion, and afterward falls off in one piece in the shape of a lid or cover.)

There are about 300 species of Eucalyptus, but only a few of which can be mentioned here. Natives of Australia, they are known for their very rapid growth, so that the figures given relative to their growth are almost unbelievable in some cases, but the rapidity of their growth is greatly in their favor when used in California.

Most of the Eucalyptus are very drought resistant but the Swamp-gum, *Eucalyptus gunni*, grows in swampy places and has been planted

Note the unusual flowers and woody capsules of the Eucalyptus globulus

in Italy where it has transformed the malarial swamps of the Campagna into a place of livability.

The bark of some kinds peels off or "moults" in long strips or plates, leaving the smooth inner bark exposed beneath. The appearance of a "moulting" Eucalyptus is very picturesque and striking, but such a condition has its disadvantages, too, especially when the trees are planted near highways. Other species have persistent bark, which is either smooth or corrugated; fortunately many are suitable for use as shade trees.

Botanical Characteristics. The leaves are simple, without teeth, often curving at the tip, thick and leathery. The flowers are without petals but often showy due to a large cluster of stamens. The fruit is a bony capsule. The whole plant is strongly scented.

The Peppermint Gum, *E. amygdalina angustifolia*, is a graceful, spreading species with very narrow, light green leaves and white flowers which are open from January to April. This is one of the tallest trees, attaining a height of 325 ft. Bailey says that reputed heights of 400 to 500 ft. are erroneous.

The Gungurru, *E. caesia*, has a drooping habit and handsome salmon-pink flowers, making it one of the most beautiful species.

Port Gregorygum, *E. calophylla*, is a medium sized tree, similar to the Scarlet Gum, with dark, corky, deeply furrowed bark; oval to lanceolate leaves, and with white, cream, or even pink flowers, opening July to October. It is frequently used as a street tree in coast regions.

The Lemongum, *E. citriodora* (*maculata*) sheds its bark during the blooming period, leaving the smooth white bark beneath. The flowers are a creamy white, opening May to July. This species is quite sensitive to frost and should be grown in region 5. A clear white oil is extracted from the lemon-scented leaves and is used as a perfume for soaps.

The Illyariegum, *E. erythrocorys*, is a small tree with outstanding red caps on the buds, when shed they reveal squarish golden yellow flowers.

The Scarletgum, *E. ficifolia*, is a good avenue tree, resisting drought and heat. Its red, pink, and orange flowers are very large and showy, opening in August and September. This is the most popular of the species for garden or street planting.

The Bluegum, *E. globulus*, is probably the most interesting and important species. It was introduced into Europe through the Mediterranean region in the early part of the Nineteenth Century by Baron

von Mueller. It is quite sensitive to extreme cold and sudden changes of weather. It is adapted to regions 3 and 5. It reaches a height of 300 ft. in Australia. The leaves are blue-green in color, sickle shaped sometimes a foot long. The flowers are white, being open December to May.

Variety *compacta* has sported from *E. globulus*, and is compact, densely branched and symmetrical.

The Redbox or Australian-beech, *E. polyanthemos*, is interesting because of the rather small, bluish-green, oval leaves and the light gray, non-shedding fibrous and rough bark. It is adapted to regions 5 and 10. The flowers appear in January and continue till April.

The Creek or Redgum, *E. rostrata*, is commonly grown for commercial and ornamental purposes. It is also drought resistant and can endure extremes of temperature. The leaves and bark are both very variable in character. The flowers are open from April to July. It is a favorite both for us as a shade tree and as a windbreak.

The Mulga Ironbark, *E. sideroxylon rosea*, produces deeply fissured bark which is reddish but becomes quite dark as though scorched by fire. The rose-colored flowers hang in long, drooping clusters and is one of the handsomest species.

The Coralgum, *E. torquata*, is a small tree seldom over 12 feet tall. The buds are like coral earrings or tiny Chinese lanterns. It is a tree for the garden rather than for the highway.

The Mannagum, *E. viminalis*, has leaves which are long and narrow. The bark often sheds and is grayish-white. It flowers from May to August.

Faults. As already stated, some of the Eucalyptus grow so rapidly as to become weedy. Some enter sewers. They are shallow rooted and blow over unless in a protected place.

Propagation. John McLaren advises sowing the seed in sandy soil in March or early April. Cover thoroughly with leafmold; shade lightly until the seed germinates. When the seedlings have produced four or five leaves, use lath screens over them, and transplant to boxes when 2 in. high. Plant in the open in March or April.

EUCOMMIA (Hardy Rubber)

(Eu-kohm′-mi-a. Name comes from *eu*, good; and *kommi*, meaning gum; referring to latex.)

Hardy Rubber, *Eucommia ulmoides*. This is found in C. China. It is a small tree, growing 60 ft. high. The old bark is gray. The upright twigs are yellowish-brown, dotted; the pith is partitioned.

This is the Hardy Rubber, Eucommia, which contains a milky juice so that when the leaves are broken the various sections cling together by threads of congealed rubber

The flowers are not at all showy. The elliptic or ovate leaves are very sharply pointed, with a broad wedgelike or rounded base. They are 3 in. long and are serrate, becoming slightly rough at maturity. They resemble the leaves of the Hackberry. The tree does not produce enough rubber for commercial extraction, but the observer is interested in breaking the leaves the sections of which cling together by congealed strands of rubber.

PROPAGATION

Rehder says: "Propagation is by seeds and greenwood cuttings under glass."

EUONYMUS (Evonymus)—Spindletree

(Eu-on′-i-mus. Name means plant of good repute.)

There are many species of Euonymus, some being very low ground covers, others dense shrubs, and still others are climbers. The species which we are mentioning in this book may be considered as low growing, shrubby trees. Due to the diversity of their forms we cannot draw a strict line between the shrubs and the trees.

Botanical Characteristics. The twigs are usually four-angled. The buds are usually conspicuous, with overlapping scales. The leaves are opposite, although somewhat alternate. The individual flowers are not showy but in several species they are produced in great abundance, in which case they give a hazy effect in the landscape. Most species produce brilliantly colored fruits somewhat like those of the climbing American Bittersweet. Due to the resemblance, some species of Euonymus are known as Bittersweet.

Species

Brook Euonymus, *Euonymus americanus*. Also called Strawberry-bush, Bursting-heart, American Burningbush, and American Spindle-tree. This is a native of Canada and United States. It is a shrubby, small tree, growing little more than 8 ft. tall. The fruits are rough, warty, light scarlet, with orange pulp inside. They ripen in September and October. The foliage is dark green, 1½ to 3 in. long, abruptly pointed, with round teeth. The bark of the twigs is light green. This species is frequently confused with the European Burningbush. It grows in shady woods and on the margins of swamps.

Wahoo, *Euonymus atropurpurea*. A native of New York to Florida, west to Minnesota, Nebraska, Oklahoma, and Texas. It is recommended for regions 1-9, 13-30. It grows 20 ft. tall. The flowers are maroon-purple. The leaves are larger than those of the European Spindletree, and are hairy beneath. The fruit is pomegranate purple, darker than the European Burningbush. It grows along water courses.

Winterberry Euonymus, *E. bungeanus*. This species is described as having free growth, and its admirers have characterized it as having careless grace. This small tree attains a height of 15 ft. and is very profuse in flower production. The flowers are yellowish-white, produced in June. The leaves are narrow, drooping, 2 to 4 in. long, and always have a yellowish cast when seen from a distance upon the trees. They turn pale yellow in the Fall. The fruits, which are four-angled, are rose, pale yellow inside. They remain on the trees after the leaves have fallen.

Variety, *semipersistens*. Has semi-evergreen leaves. It fruits sparingly.

European Burningbush, *Euonymus europaeus* (*vulgaris*). Also called Spindletree, Pricktimber (from its use as skewers and meat pins). This is a native of Europe, extending into Western Asia. This species is a better grower than *Euonymus americanus*. It attains a height of 20 ft. The fruits are not warty and are pink in color. The twigs, bark and leaves are acrid and fetid when bruised. The foliage is oval, 1 to 3 in. long, with rounded teeth. The leaves turn dark purple in the Fall. This is a useful species because of its ornamental fruits. It is frequently used where a tall shrub is needed, but a tree would be out of place. It is well used, then, as a background for large shrub groups. It is curious to hear that the wood of the European Burningbush is used for charcoal crayons. Loudon says that the powdered leaves and berries were formerly used to rid children's heads of lice; hence one name was Louseberry.

Variety *fructo-coccineus*. Has red fruits.

Variety *fructo-alba*. Has white fruits.

Broadleaf Burningbush, *Euonymus latifolius*. This is a small tree or a large shrub, with erect branches which may be described as being loose and complicated. It grows to a height of 20 ft. The branches are smooth, with reddish-green bark and long-pointed dark brown buds. The flowers are greenish. The leaves are wide, 2 to 5 in. long, a trifle wider above the middle, pointed. The fruit is smooth, bright red, and orange within.

Propagation

Seeds grow readily if the pulp is removed from them and then they are stratified and sown in the Spring.

Grafting. Meehan says that grafting *E. americanus* upon *E. europaeus* makes the berry display more abundant.

EUPTELEA

(Eu-tee'-le-a. From Greek *eu*, which means *well* or *handsome*, and *ptelea*, which is *Elm*, referring to the shape of the fruit.)

There are several species of Euptelea, which are large shrubs or small trees, somewhat resembling the Lindens in habit and leaves.

Euptelea polyandra. This sometimes gets to be 45 ft. tall and it is hardy. The twigs are zigzag, greenish. The Winter characteristics are: lack of terminal buds, and seven bundle scars in the leaf scars. The pith is solid. The flowers are produced in earliest Spring before the leaves. Each of the flowers is only one sex; the male flowers have

orange-red anthers and are produced in short, dense clusters, and the female flowers are produced in long clusters. The leaves resemble European Hornbeam. They are slender stalked, deeply toothed, generally oval, gradually pointed, light green, greyed beneath. The foliage is reddish when unfolding, and again changes red and sometimes yellow in the Autumn. The fruits are produced in Hornbeam-like clusters.

FAGUS—Beech

(Fay′-gus. Name derived from *fago,* to eat; because the nuts were used as food in early days. It is certain that we get our word *book* from the *buch* or *beech,* thin plates of it having been used as one of the earliest bindings for volumes.)

"No tree has so fair a bole or so handsome an instep as the Beech," says Thoreau. Except the Elm, perhaps no trees are so greatly admired as native forests of Beech. The light grey of the trunks, the graceful form silhouetted against the sky, the unfolding, furry, bronze-colored leaves which also persist upon the trees through the Winter, have endeared the Beech to the American public.

Botanical Characteristics. The bark is smooth; the buds are long and sharp-pointed. The leaves are arranged in two rows to form a flat spray upon the branches. The leaves are generally deeply toothed, although in the European forms they are often without teeth. The flowers appear with the leaves. The spiny fruits ripen in the Autumn and bear within them a nut shaped like a buckwheat kernel.

American Beech, *Fagus americana.* This species of Beech grows to be 60 ft. tall. It is recommended for regions 24, 25, 26, 29. The bark is light gray and smooth. The buds are so long and narrow that the buds of few other trees resemble the Beech. The leaves, which persist in the Winter, are triangular to oblong, pointed, broad wedge-shaped at the base, and are 2 to 5 in. long. They are bluish-green above, lighter and smooth beneath, and are silky when unfolding. The tree produces prickly pods, which split on four lines, exposing four triangular nuts with a shining pale brown shell. The meat of these nuts is famous among both human folks and wood folks because of its oily-sweet flavor. Deer are especially fond of Beechnuts and their flavor often may be tasted in venison. Squirrels, too, eat the nuts freely, and so do the wood mice, not to mention the Blue Jays and the Woodpeckers and many other birds and animals, not only because they like their taste, but because their instinct tells them that the oil contained in the sweet kernel is just the kind of fuel needed to keep flesh warm in Winter. The wood is used for chairs and tool

An outstanding specimen of the Weeping European Beech which forms an immense leafy bower beneath

handles. Both as a forest tree and as an ornamental shade tree, the Beech will repay any care expended upon its cultivation. It prefers a rich, deep soil but grows well on limey or chalky soils. In the South it grows on the margins of swamps and in the rich bottomlands along streams. Of all the native trees the Beech seems to be very impatient of cultivation. The residents of real estate divisions which develop in Beech forests are usually disappointed to find that the old Beech trees gradually dwindle away and die. It seems wisest to avoid covering the soil too deeply in grading, as the Beech seems to enjoy a thick mulch of its own leaves each Winter. The American Beech, then, is decidedly a wild tree rather than one which likes to live with men. It is wise to cut back young trees for the first year or two, in which case they will transplant successfully. The European Beech is not as sensitive to cultivation.

European Beech, *Fagus sylvatica.* This tree, which grows to be 90 ft. tall, is found wild in Central and Southern Europe to Crimea. The bark is gray. The triangular or elliptic leaves are 2 to 4 in. long, have a pointed tip and a broad, wedge-shaped or rounded base. They are remotely toothed, lustrous, and remain on the trees all Winter. They are ideal used for sheared hedges but must be pruned several times during the season. If they are to be transplanted easily they must be root pruned by the nurseryman, and the transplanting must be done only in the Spring.

Variety Purple Beech. Practically includes such as are cataloged as *atropunicea, purpurea, cuprea, riversi, nigra, sanguinea, atropurpurea, purpurea macrophylla* and *purpurea major.* The young leaves are cherry red, and at maturity so dark a purple as to appear almost black. These trees vary greatly in the intensity of the color because some nurseries have raised their stock from seed.

Variety Tricolor Beech. The leaves are nearly white, spotted green, with a pink margin.

Variety Rosepink Beech, *roseo-marginata.* Leaves purple, with irregular light pink border.

Variety Cutleaf Beech, *laciniata.* The leaves are narrowly elliptical or lancelike, and are deeply lobed and incised.

Variety Fernleaf Beech, *asplenifolia* (*heterophylla, incisa.*) This variety is often as broad as it is high, and forms a compact tree without pruning. It is very twiggy so that it needs vigorous pruning when transplanted. It is similar to the variety *laciniata,* but the leaves are very narrow, often oblong.

Variety Weeping Beech, *pendula.* This variety has pendulous branches.

The Fernleaf Beech becomes a tree of graceful symmetry

Variety Weeping Purple Beech, *purpurea pendula*. The pendulous branches bear purple leaves.

Comparisons. *Fagus sylvatica*. More compact growth. The leaves are fine-toothed and have five to nine pairs of veins.

Fagus americana. Leaves are coarse-toothed and have nine to fourteen pairs of veins.

Propagation

Seeds. Mix the seed with sand and place in cool storage until Spring, or sow the seed in the Autumn away from mice. Nurserymen should transplant the Beech frequently.

Layers. The weeping sorts readily layer if the branches are covered with soil.

Grafting. The weeping and the cutleaf Beeches are grafted on the European Beech. Most nurserymen find that they are more successfully grafted in the greenhouse.

FRANKLINIA (Gordonia)

(Frank-lin'-ia. Named after Benjamin Franklin and discovered by John Bartram. Gordonia named after James Gordon, English nurseryman, 1728-1791.)

Franklinia alatamaha (*pubescens*) attains a height of 30 ft. and is often shrubby. It is hardy only as far north as Philadelphia. The bark is not unlike Carpinus, being smooth and thin. The young branches are silky and upright. The large, solitary white flowers are 3 in. across and are set upon the stem with almost no petiole. They appear late in the season; July in the Carolinas, August in Philadelphia. The leaves are 5 to 6 in. long and are wider at the tip than at the base, sometimes oblong, gradually narrow into short petioles. They are remotely toothed, pointed at the tip, and are hairy beneath. They turn crimson in the Fall. The fruit is a woody capsule. It thrives in a low, moist, peaty subacid soil, and will tolerate some shade. It belongs to the same family as the Tea and Camellia.

History. "To those rare wild plants which exist today only in isolated groves or as scattered individuals there is attached an unique interest. In the past ages the world of plants has undergone vast changes. Few of these can compete with the Franklinia in rarity. This remarkable tree was first found on the banks of the Alatamaha River in Georgia, 1765, by John Bartram."

Loblolly-bay, *Franklinia lasianthus*. This tree is a sub-evergreen, growing 50 to 60 ft. high. It is found native from Virginia to Louisiana. The leaves are 3 to 6 in long, oval, pointed, slightly toothed, shining.

This outstanding tree, the Franklinia, bears white flowers related to the Camellia

The white flowers are 1 in. broad and are sweetly fragrant, opening in July and producing a few in August and September. It is said that there were tracts of 50 to 100 acres in the South which were called bay swamps.

It will be interesting to read in detail of the propagation as related by Frederick V. Coville, botanist of the U. S. Department of Agriculture, in the *Florists Exchange:*

Propagation

From experiments that I began in 1911 it was found that the tree is an acid-soil species, that it is easily propagated from cuttings and seeds, and that it grows luxuriantly and flowers profusely in the very acid soils of the Pine barrens of New Jersey. Its rarity in cultivation and its reputation as a difficult plant to grow have been due chiefly to a lack of understanding of its soil requirements.

To obtain material to illustrate the behavior of Franklinia in acid and non-acid soils a new experiment was begun on Feb. 8, 1923. Ten well-rooted, dormant, leafless cuttings were potted in 3 in. porous earthenware pots in a standard acid-soil mixture consisting of two parts of Kalmia peat and one part of sand. Eleven other rooted cuttings of Franklinia were potted in the same manner in a neutral soil consisting of one part of rotted turf loam, one part of well-rotted cow manure, and one part of sand. Both lots were plunged in sand in a greenhouse maintained at 55 deg. F. at night and 70 deg. during the day. The plants varied somewhat in size, but they were selected pair by pair so that the two lots were exactly comparable except for the soil in which they were potted.

Eight weeks later all ten plants in the acid soil were growing well, their leaves of a healthy green color, and their average height 4⅛ in. Of the 11 plants in the neutral soil two were dead. The nine that were alive had yellowish-green leaves, and their height averaged 3⅛ in.

Since the nine living plants in the neutral soil were evidently sick and getting worse, an experiment was undertaken to determine whether such sick plants could be resuscitated with aluminum sulphate. The nine plants were arranged in sequence, from the best to the poorest. To the second, fourth, sixth, eighth, and ninth were given 1.25 grams of aluminum sulphate each. This was immediately dissolved and washed into the soil by repeated syringing with water. Thus five of the plants made sick by the neutral soil were treated with aluminum sulphate and four were left untreated.

On May 16, at the end of six weeks, the average height of the four sick and untreated plants was 4¾ in., their older leaves were yellowish green, some of the leaves were scalded by the sun, and the latest young leaves were nearly white. The other five plants, treated with aluminum sulphate, had resumed normal growth, with normal green leaves, though the older scalded leaves still remained pale. Their average height was 5½ in.

Ten weeks later, on July 26, * * * the untreated plants were small, pale, and weak. The plants treated with aluminum sulphate not only had recovered from their sick condition but had put out new leaves, shed their old ones, and grown to twice the height of the other plants. Photographs taken ten weeks apart show conclusively the stimulating effect of soil acidity on this plant, whether the acidity is natural or is brought about artificially by the application of aluminum sulphate.

WHEN leaves become yellow but not diseased the condition is known as chlorosis. This is due to an excess of lime magnesium, sodium, potassium, carbonates, and manganese, accompanied by a lack of iron. This is the advice of DR. CARL G. DEUBER.

FRAXINUS—Ash

(Frax'-in-us. The ancient Latin name for *Ash* because it is derived from the Greek word which means *to separate,* alluding to the ease with which the wood splits.)

This is a group of rapid growing trees which develop into broad, spreading specimens valued in large parks and on ample lawns. The shade cast by the trees does not prevent good sod beneath them. The Ash is related to the Privets, Goldenbells, and the Lilacs.

Botanical Characteristics. The Winter buds of the Ash are very characteristic, being brown or black, and rough, fitting into the top of a somewhat shell-shaped leaf scar. The leaves are opposite and compound. The fruit is a one-seeded nut, provided with an elongated wing.

Legends. There are many stories and superstitions regarding the Ash. Lightfoot writes that when a baby is born in the Highlands of Scotland the nurse places a log of Ash in the fire, and while it is still burning, gathers in a spoon the sap, which oozes from the other end. A spoonful is given to the newborn infant.

Edda, the sacred book of the Northmen of Scandinavia, relates that the court of the gods is held beneath a mighty Ash whose top reaches to the heavens, its branches overshadow the whole earth, and the roots penetrate to the infernal regions. An eagle surmounts the tree to watch everything that passes. A squirrel constantly travels up and down the trunk to report what the eagle sees or fails to see.

Species. White Ash (American Ash), *Fraxinus americana.* This tall tree, which attains a height of 120 ft., is native in Nova Scotia to Minnesota, and south to Florida and Texas. Recommended for regions 1, 2, 6, 22-29. It is a noble tree with a straight, tall trunk. The Winter buds are often superposed, usually brown or black. The tops of the leaf scars are indented. The twigs are dark green or brownish and are lustrous. The male flowers are often attacked by mites, which cause them to grow berrylike. For this reason such flowers are often mistaken for fruit. The leaves are opposite, with the five to nine leaflets stalked, arranged like a feather. The leaflets are triangular or lanceolate. The trees are late coming into leaf, and turn yellow or purple in the Fall. The fruit is winged. The White Ash prefers a moist, fertile soil, but is found also on dry hillsides. It makes a good street tree, except in smoky cities, inasmuch as it has pleasing, symmetrical lines and makes a rapid growth. It is not subject to many pests. The wood is used for tool handles, oars, and furniture.

European Ash, *Fraxinus excelsior*. This Ash is found wild in Europe and Asia Minor. It is tall, reaching 90 to 120 ft. The Winter buds are black and the twigs are smooth. There are seven to eleven leaflets, set upon the stem with almost no petiole, are fine-toothed and wedge-shaped at the base. The fruit is notched at the apex. The European Ash prefers a good limestone soil, not boggy but near the water. The branches are used as hoops for barrels. This tree is used for all sorts of agricultural implements. In ancient times the leaves were even used for fodder. There are many varieties with variegated

The bud characteristics of the various kinds of Ash. Note that the twigs of the Blue Ash are four-angled. The buds of the European Ash are black; the others are brown. The leaf scars are quite straight at the top in the Red and Green Ash, whereas there is a deep notch in the leaf scar of the American Ash

and cut leaves, and another of weeping habit. The Weeping European Ash is considered a splendid specimen tree for large lawns, where it produces a canopy of drooping branches.

Black Ash (Hoop) (Basket) (Brown) (Swamp), *Fraxinus nigra* (*sambucifolia*). The Black Ash attains a height of 60 to 80 ft. The ash-gray bark is tinged with buff. The bark is not deeply ridged, so that it may be rubbed off easily, exposing a soft surface not unlike asbestos or talcum powder. The twigs are not shining. The buds are black, the terminals are pointed as long as they are broad. There are seven to eleven long-pointed leaflets set upon a stem over a foot long without stalks. The Black Ash prefers a swampy soil seldom thriving in dry soil or even ordinary soil of cultural areas. To adapt it to dry soil, Jackson Dawson grafted it on American Ash and then it thrived well. The Black Ash is used for interior finishing, bean poles, cabinet making, barrel hoops and fences. The Indians made baskets from it by splitting the wood. If the split wood is bent abruptly it will separate into layers.

Flowering Ash (Manna Ash), *Fraxinus ornus*. (The name *ornus* is from the Greek *oros*, which means *mountain*.) This is a handsome flowering tree with a round head, found wild in Southern Europe and Western Asia, and growing to be 25 ft. tall. The Winter buds are grayish or brownish. The flowers are white or greenish and are fragrant. They are borne in dense branching clusters. The seven, stalked leaflets are broader at the tip than at the base, and they are 1¼ to 3 in. long. They are abruptly pointed and are irregularly toothed. When used for veneer, the large knots are not unlike an agate in appearance. The hardened sap is known as manna and is used as an aperient.

Red Ash (Brown) (River), *Fraxinus pennsylvanica* (*pubescens*). The Red Ash is a smaller tree than the White Ash and attains a height of only 30 to 70 ft. It is a native to eastern United States and west to Nebraska and Kansas. The bark is gray-brown, with an inner surface which is red when first cut, hence the name Red Ash. The slender twigs are densely arranged and are velvety and downy. The leaf scars are not concave, thus distinguishing the Red Ash from the White Ash. There are five to nine, stalked leaflets, slightly toothed, yellowish-green, and rather hairy. The fruit is long and slender. It is found in rich valleys, swampy lowland, and occasionally on drier hillsides. The wood of the Red Ash is inferior to that of the White Ash because of the brownish color.

Variety *lanceolata*, the Green Ash, has narrow leaflets.

Blue Ash (Winged Ash), *Fraxinus quadrangulata.* This handsome and vigorous tree grows to be 120 ft. tall. It is a native of the limestone regions and it needs lime when it is cultivated. It thrives in the northern prairies. The branches are four-angled and are usually winged. There are seven to eleven leaflets. It is said that a blue color may be extracted from the inner bark.

PROPAGATION

The seeds are hard and should be sown as soon as ripe in the Autumn or treated with alkali or with acetic or dilute sulphuric acid when sown in the Spring. They frequently do not germinate until the second year. The Boyce Thompson Institute has found that the Green Ash germinates best at a temperature of 41 degrees for 30 days, and the Flowering Ash has to be submitted for 90 days to a temperature of 58 degrees.

Grafting. The Green Ash and the Golden Weeping Ash are budded or grafted on the European Ash. They are budded in July.

GINKGO (Salisburia)—Maidenhair-tree

(Gink′-go. In the proceedings of the German Forestry Society it relates that the original way of spelling this name was *Ginkyo,* the *g* having been used as a typographical error.)

The Ginkgo is one of the most primitive of our trees and botanically it ranges beneath the flowering trees and even beneath the conifers. To the casual observer the Ginkgo is perhaps the most Japanesque in appearance of any tree, inasmuch as the leaves are fan-shaped. It is grown successfully in regions 1, 2, 24, 25, 27, 28, 29 and 30.

Maidenhair-tree, *Ginkgo biloba* (*Salisburia adiantifolia*). This is also called the Silverfruit, so named by the Chinese because the nuts are silver. It is found native in Eastern China. It usually grows with a single trunk to a height of 120 ft. The bark is ashen gray. The branches are nearly parallel. The twigs are yellowish-brown and smooth. The bark of the twigs separates in shreds. The fan-shaped leaves are alternate, formed in clusters of three to five on spurs. They are 2 to 3½ in. across and are more or less incised. They turn gold in the Fall. The fruits are obovoid, yellowish, and are ill-smelling, due to a fatty acid called ginkgoic acid. This tree is indifferent to heavy or light soil. It transplants readily. The Ginkgo was found originally in temple gardens of Japan and China, but is adapted to the city planting and is used for shade trees. Male trees only should be planted because of the odor of the fruits.

The fan-shaped leaves of the Ginkgo are distinctive. The fruits are plum-like and have a bad odor

PROPAGATION. The seeds should be washed clean of their pulp and sown in the Spring, whereupon they germinate quickly.

GLEDITSIA—Honeylocust

(Gle-dit'-si-a. Named for G. Gleditsch, director of Berlin Botanical Garden.)

Honeylocust, *Gleditsia triacanthos*. Also called Honeyshucks, Sweetlocust, and Three-thornlocust. The Honeylocust is successfully grown in regions 1, 2, 3, 7, 8, 9, 10, 11, 13, 16, 17 and 23. These trees have large, picturesque, broad heads and are noted for their stout-branched spines, which are often 2½ to 4 in. long and are produced upon the trunk and branches. The twigs are zigzag, smooth and glossy. The white or greenish flowers are not conspicuous. The leaves are pinnate or twice pinnate, 5½ to 8 in. long, with 20 to 30 oblong to lanceolate leaflets remotely round-toothed. The foliage

turns a clear yellow in the Fall. The Honeylocust thrives on the rich soils of river bottoms. Its presence is a sign of fertility. It demands light. The objections are its thorns, and the pods which drop on the lawn all during the Winter. It stands severe shearing and so is sometimes used as a hedge. The wood is used for fence posts, rails, and hubs of wheels.

The Moraine or Thornless Honeylocust. This variety is thornless and has more slender branches and looser habit. It is advised for lawn planting in preference to the thorny type, inasmuch as that type is dangerous to playing children.

PROPAGATION

Seeds. Wash the pulp from the seeds. Sow them in the Spring, after keeping them moist through the Winter. The seed is extremely hard, so that it is frequently scalded with boiling water and sown in the Spring.

Grafting. The Thornless Honeylocust is grafted on seedlings of the type.

GREVILLEA—Silk oak (Australian-ferntree)

(Gre-vil-le-a. Named for C. F. Greville, British patron of botany.)

Silk oak, *Grevillea robusta*. It attains a height of 150 ft., but is grown in northern greenhouses as a potted plant. The flowers are orange colored, which attract the bees. The leaves are twice pinnatifid. In other words, they are very deeply lobed, so as to seem compound. They somewhat resemble the foliage of our common Ragweed. The Silk oak grows in regions 5, 31 and 32. It is drought resistant. The branches are brittle and it is not advised for street trees.

PROPAGATION. This is easily grown from seed in the northern States and grow very rapidly. Von Mueller says that in Ceylon it attains a stem circumference of 5 ft. in eight years.

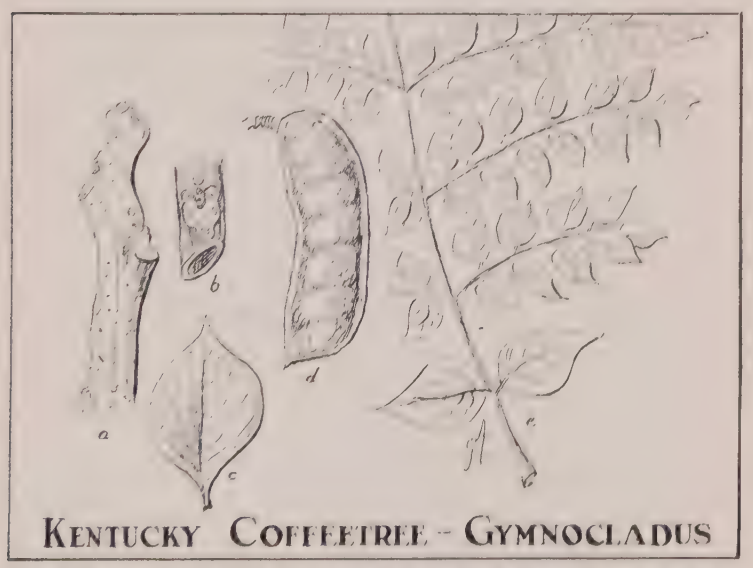
GYMNOCLADUS—Kentucky Coffeetree

(Jim-nok-lay-dus. Name derived from *gymnos*, naked, and *clados*, branch, referring to the stout branches destitute of twigs.)

Kentucky Coffeetree, *Gymnocladus dioica* (*canadensis*). Also called Coffeenut, Stumptree, and Nickertree. This is a native of New York and Pennsylvania to Minnesota, Nebraska and Tennessee, and it is grown successfully in regions 22 and 24. The short trunk is often divided into several parallel branches. The crown of the tree is narrow. The twigs are hairy at first and in the Winter appear as if they had

been painted with gray paint which had now partly worn away and they were in need of a second coat. The bark of the trunk is curiously ridged and bears thin, scaly flakes attached at the side. This characteristic of the bark is distinctive and is readily seen by the casual observer, who often remarks that the trunk appears like a rolled magazine held in the hand. The Winter buds are very small and two or three of them are often placed one above another. The pith is large, salmon to brown. The flowers are greenish white and are borne in terminal panicles. A tree is either male or female but not both. The leaves are bipinnate, with 100 leaflets 6 to 12 in. long, three to seven pairs of pinnae, lower reduced to simple pinnae, and upper with six to fourteen leaflets. They are pink when unfolding and turn gold. The Kentucky Coffeetree has thick, flat, pulpy pods, brown, 1½ to 2 in broad and 6 to 10 in. long. They persist through the Winter. It is found in rich woods and bottomlands.

This broad tree is of great interest when one has space to let it spread its heavy branches. The species name *dioica* refers to the fact that each flower is of one sex only.



a, twig; b, the curious leaf scars with a series of three tiny, bead-like buds above each; c, a leaflet; d, the seed pod; e, a portion of the large, many-compounded leaf

The early settlers used the seeds as a substitute for coffee. The wood takes a good polish and is used for cabinet making. Because it is durable in soil it is used for fence posts. The leaves soaked in water and sweetened with sugar were used as fly poison. The pulp of the pods of a Chinese species is used in place of soap.

PROPAGATION

Seeds. The seeds are extremely hard and should be scalded before sowing them in the Spring. Seeds are freely self sown in the wild.

Cuttings. Hardwood cuttings root readily.

The rather inconspicuous flowers and the large compound leaf of the Kentucky Coffeetree

HALESIA (Mohrodendron)—Silverbell

(Hayl′-zi-a. Named for Stephen Hale, who lived from 1677-1761.)

Silverbell (Snowdroptree), *Halesia tetraptera* (*carolina*). The Silverbells are attractive small trees, grown for their bell-shaped, drooping flowers. They are found native from West Virginia to Florida and Eastern Texas. The Silverbell is of irregular habit and grows 30 ft. tall. The bark separates into small close scales. The young twigs are clothed in hairs which are star-shaped. It has pinkish buds and white flowers, borne in pendulous axillary clusters of two to five flowers. Each cluster is from ½ to ¾ in. long. The triangular or elliptic leaves are 2 to 4 in. long and are finely toothed. They turn yellow in the Fall. The fruit is four-winged.

The Silverbell, Halesia, bears drooping white flowers

Mountain Silverbell, *Halesia monticola.* This tree is perfectly hardy in the Arnold Arboretum, growing to be 90 ft. tall. When it is young it is pyramidal; later it develops a round top. When only10 ft. tall it blooms. The corolla of the blossoms are ¾ to 1 in. long, being somewhat longer than those of *Halesia tetraptera.* The bark peels like that of the Shagbark Hickory. The Mountain Silverbell is used for street and roadside planting.

Two-wing Silverbell, *Halesia diptera.* This tree grows 30 ft. tall and is found native in South Carolina and Tennessee to Florida to Texas. It is less hardy than *Halesia tet-*

The profusion of bloom in Halesia tetraptera is well shown in this picture taken in Highland Park, Rochester, N. Y.

raptera and is not as free flowering. The young twigs are hairy when young and later become smooth. The corolla is deeply lobed. The flowers are in clusters of three to six flowers. The triangular leaves are 4 to 5 in. long, are sharply pointed, finely toothed, and are soft and hairy. The fruits are two-winged.

Halesia hispida. See *Pterostyrax hispida*, Epaulette-tree, page 315.

Propagation

Seeds. Sow the seeds as soon as ripe; they take a year to germinate. The Halesia is used as a stock for Styrax.

Cuttings. Root cuttings may be taken in the Spring or Autumn.

Layers. They are successful.

HICORIA (Carya)—Hickory, Pecan

(Hy-kor′-i-a. Derived from the old American name for these trees.)

There are many sorts of Hickory growing in the forests of the United States, but many of them have hybridized together so that it may be very difficult to tell them apart. Some, of course, have very superior nuts, and others have almost no meat. There is a great opportunity for someone who is interested in improving our American Hickory nuts. At several of the nut shows, varieties have been exhibited with the attempt to find superior sorts worthy of propagation See chapter on nut culture, page 91.

Species

Mockernut, *Hicoria alba* (*tomentosa*). The bark is close and ridged. The twigs are hairy. The buds are small, and the outer bud scales are not retained in the Winter as those of the *Hicoria ovata*. There are five to seven, sometimes nine, leaflets. The petioles are short and downy, as is also the lower surface of the leaves. The husk of the nut is pear-shaped, splitting to the middle or below. The shell is very thick and hard, containing a very small, often almost absent, sweet kernel. The nuts are hard to crack. The name Mockernut is applied because it resembles a hickory nut but has so little meat that its hard shell is hardly worth cracking. The Mockernut does not thrive in the shade.

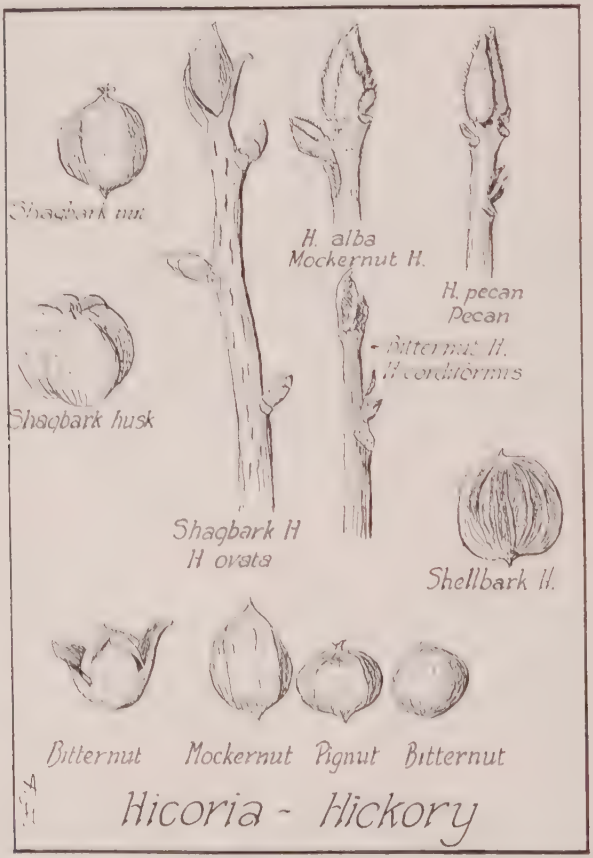
Bitternut, *Hicoria cordiformis* (*amara*). This is a native of New Jersey to Illinois. The trees grow 70 ft. tall. This species has five to nine leaflets; the terminal one longer than the others. The buds are naked, bright yellow, and dotted. The lateral buds are usually one above another. The bark is broken into thin scales. The nut is so bitter that squirrels will seldom eat them until all other food is exhausted. The nut is abruptly contracted to a sharp point.

Pignut (Broom Hickory) *Hicoria glabra*. Successfully grown in regions 24, 27 and 28. The Pignut has three to seven leaflets, usually five, dotted beneath. When the twigs are young they are greenish, becoming reddish and finally gray. The buds are small. The nut is slightly angled, astringent. The husk of the nut is fig-shaped, thin and splits to the middle. Hogs are often turned in groves and are fond of these nuts as mast.

Shellbark Hickory (Kingnut), *Hicoria laciniosa* (*sulcata*). The Shellbark Hickory has a narrow, oblong crown and short, spreading branches, and grows to be 60 to 80 ft. tall. It has a shaggy trunk with bark that flakes off in large pieces. The twigs are pale orange.

There are usually seven leaflets, 5 to 9 in. long. Oftentimes the petioles are left on the tree in the Winter. The nuts have a yellowish, thick, woody husk, splitting to the base. The nut is four- to six-ridged, strongly pointed on both ends. The kernel is sweet. The Shellbark Hickory thrives in wet, rich soil.

Shagbark Hickory, *Hicoria ovata* (*alba*). This is a narrow headed tree, growing 120 ft. tall, found in regions 24, 26, 27 and 28. Someone



The distinctive characteristics of the twigs and nuts are discussed in the text

has called it the ragamuffin of trees. The branches curve down. The bark is shaggy, light gray. The twigs are scurfy and hairy at first. Later they become smooth and red-brown. It has numerous pale long lenticels. The flowers are not conspicuous. There are five, rarely seven, elliptic to oblong lanceolate leaflets, 4 to 6 in. long, pointed at the tip, and toothed. They are fragrant when crushed. It bears broad, obovoid, sweet nuts, contained in a thick husk. The nut is flattened and angled, is white, and has a thin shell. The husk splits to the base. The Shagbark Hickory prefers a light, well drained loam. It is found on low hillsides and river banks. It is very slow in growth and is difficult to transplant. The wood is used to make tool handles and light vehicles. It is strong and elastic but it soon decays.

Pecan, *Hicoria pecan*. The Pecan is found native from Iowa and Indiana to Alabama, Texas and Mexico, and is grown successfully in regions 19, 20, 22, 25, 28, 29, 30 and 31. It attains a height of 150 ft. The bark is deeply furrowed. The buds are short, downy, and yellow, and the twigs are hairy when young. There are eleven to seventeen short stalked leaflets, which are oblong lanceolate and toothed or doubly toothed. The leaves are 4½ to 7 in. long and are hairy when young. The fruits are oblong or ovoid.

Propagation

Seeds. Hickory nuts may be stratified in boxes, protected with wire screens and sown in the open in the Spring, or they may be sown in a safe place in the Fall. Joseph Mechan says that nuts sown in sandy or very light soil produced a better supply of roots and therefore allowed being transplanted as safely as seedlings of the Maple. In stony soil as well as sandy, plants of all kinds make more small roots than when in a heavy, deep soil.

Inasmuch as the seedlings are difficult to transplant, it is wise to transplant them when young or raise them in wire-bottom flats and cut off the roots as soon as they come through the bottom.

Grafting. Superior varieties of the various species of Hicoria may be selected and grafted.

HIPPOPHAE—Sea-buckthorn

(Hip-pof′-ay-ee. From *Hippos*, meaning *horse*, and *phao, to kill*.)

These spiny small trees are related to the Russian-olive and Elaeagnus, and like them the branches are covered with silvery scales.

Sea-buckthorn, *Hippophae rhamnoides*. Native to Europe and Asia. It is a shrub or small tree, sometimes attaining a height of

30 ft. but usually only 8 to 12 ft. It is considered hardy. It is upright and twiggy. The Winter buds are golden. The branches are gray, spiny tipped, and the young growth has silvery scales. The flowers appear before the leaves and are yellowish. They are borne in clusters of three. The lanceolate leaves are alternate, fine, and silvery. They turn orange in the Fall. The fruit is ¼ to ½ in. long and is bright orange; it ripens in September and is good in the Winter. Prefers sandy soil, although Edwin Mathews reports that it does equally well in the moister clays. The best position is in damp soil near a running stream where the subsoil is always moist.

Comparisons. *Hippophae* is distinguished from *Elaeagnus*, which has four sepals, whereas *Hippophae* has two; and from *Shepherdia*, which has opposite leaves and eight stamens, whereas *Hippophae* and *Elaeagnus* have four stamens.

Propagation

Seeds. The plants usually produce only one sex, so that individual plants seldom perfect seeds. Seeds may be sown in the Spring.

Layers. They are slow.

Cuttings. Root cuttings are sometimes used.

HOVENIA—Raisintree (Ken or Kenpokonas in Japan)

(Hoh-veen'-i-a. Named for David Hoven, senator of Amsterdam, who encouraged Thunberg in his travels.)

Raisintree, *Hovenia dulcis* (*acerba*). The Raisintree is a native of Japan and China. It is a broad topped tree, attaining a height of 30 ft. The bark is like that of the Silver Maple. The twigs are speckled and striped. The flowers are fragrant and white. The branches of the flower heads are cherry red. The more or less heart-shaped, shining leaves are 4 to 6 in. long, are alternate, and have long petioles. They are palmately three-ribbed, and are coarsely toothed. Both sides are roughened by hairs. The sweet, edible fruits are clustered in the axis of the leaves. The Raisintree thrives in sandy loam. Bees are attracted to the tree.

Propagation

Seeds. Grows readily from seeds.

Cuttings. Ripe wood in the Summer.

Layers. Done in late Spring.

Cuttings. Root cuttings are successful.

ILEX—Holly

(I′-lex. The derivation of the name is interesting as told by Loudon; "Theophrastus and other Greek authors named the Holly *Agria;* that is, wild, or of the fields; and the Romans formed from this the word *Agrifolium,* and called it also Aquifolium, from *acutum,* sharp, and *folium,* leaf. C. Bauhin and Loureiro first named it Ilex on account of the resemblance of its leaves to *Quercus ilex,* the true Ilex of Virgil. Linnaeus adopted the name *Ilex* for the genus. The name of Holly is, no doubt, a corruption of the word 'holy,' as Turner in his *Herbal* calls it Holy, and Holy Tree, probably from its use to commemorate the holy time of Christmas.")

Holly is grown extensively in the Northwest for shipment to many sections of the United States. H. D. Locklin, of State College of Washington, writes: "The commercial prospects for growing the better strains of English Holly appear to be good. The cultivated Holly is superior to the native, which cannot be sold when the European variety is on the market." He tells us that the English Holly is a very long-lived tree and that in England there are trees which are known to be 300 years old. Berries are produced at the age of eight years; the slower growing trees produce berries sooner than trees making very rapid growth.

The climatic requirements are fairly definite and eliminate most of the states from the culture of this crop. If the temperature remains above 100 degrees F. for many days the leaves turn brown and drop. For best growth the air should be cool and relatively moist. A temperature below 10 degrees F. is sure to cause tip killing, and at zero the injury is certain to be severe. Yields will vary because of the different growing conditions, but would average ten pounds of branches per tree.

"Growing Christmas Holly on the Farm," by Perkins Coville, Farmers' Bulletin No. 1693. This deals mainly with English and American Hollies.

Species

English Holly, *Ilex aquifolium.* Grows to be 45 or even 75 ft. tall. It is native to Western and Southern Europe, North Africa, Western Asia to China, and is successful in regions 1, 2, 28, 29, 30, 31, and 32. It has short, spreading branches to form a pyramid head. The leaves are triangular to elliptical, 1¼ to 3 in. long. The margin of the leaves is wavy with large, triangular teeth. The surface is lustrous. The fruit is red and usually clustered. Some of the old books give as many as thirty varieties differing in the form of the leaves, quantity or lack of spines, and color of the leaves.

Dahoon, *Ilex cassine.* This splendid small evergreen tree is found abundantly from North Carolina to Florida, west to Louisiana. This sort is not hardy in the North. The trees grow 30 ft. tall. The leaves

are generally obovate, sometimes sharply toothed, usually hairy beneath when young, 2 to 3 in. long. The dull red fruit is produced abundantly.

Ilex cornuta. A native of Northern China, found in 1846. It is 9 to 18 ft. tall, and is not hardy north of Washington. The leaves are large, very dark green, almost rectangular, with sharp points at each angle. They have three strong, almost equal spines at the broad apex, and one or two strong spines at each side of the base. There are large clusters of shining red fruits. Burford Holly is a variety with almost spineless leaves.

The American Holly is here seen as a low, clipped specimen, although the trees grow 45 feet tall

American Holly, *Ilex opaca.* Found native from Massachusetts to Florida and west to Missouri and Texas. It is successful in regions 28, 29, 30 and 31. It has spreading branches, forming a pyramidal head, and attaining a height of 45 ft. *Ilex opaca* is hardier than *Ilex aquifolium*, but it is not as handsome. The evergreen leaves are elliptical, with remote spiny teeth. They are dull green, not glossy, above and yellowish beneath. The red fruits are round, often solitary. The wood is used in cabinet making.

Mountain Winterberry, *Ilex monticola* (*dubia* Britt.) (*montana* Gray) (*mollis* Gray). This is a native of England and of United States and is hardy in the Arnold Arboretum. It is the tallest deciduous Holly. It is like a small tree but has many trunks. It has an upright growth. The bark of the twigs is a dull gray brown. The leaves are 3 to 5 in. long, clustered on spurs. They are fine-toothed and widest below the middle, and are light green. The fruit is red or purple, borne in clusters.

Yaupon, *Ilex vomitoria.* This is more a shrub than the Dahoon and has much smaller leaves, seldom being more than 1 in. long. The fruit is scarlet and produced on last year's wood. The range of its wild state extends from Virginia to Florida, west to Arkansas and Texas; therefore it is not hardy in the North.

Planting. It is advisable to strip the leaves from Holly when planting the evergreen sorts, inasmuch as the root system is seldom fibrous and well balanced. Besides removing the foliage, many of the branches should be cut back closely. The roots should be wrapped in damp burlap and should be kept moist until the plant is set in its new position. In planting them, see that the soil is firmly in contact with the roots. Some nurserymen use sand because it works into all crevices better than soil. Be sure to use root-promoting powder and water thoroughly so as to settle the particles of soil closely about the roots. Holly is often grown in pots in order to insure easy transplanting. Spring is the best and only time for planting, usually not before May, when the soil is warm and the roots will become active immediately. Edwin Matthews advises planting the Holly in a sheltered and secluded position in a soil that is naturally moist.

Plant in groups rather than in isolated specimens, and if possible determine the sex, making sure that there are both male and female plants in the group. Otherwise, we would be deprived of the splendid berry display. Plants are grown by nurserymen now which bear flowers which contain both stamens and pistils; these can be relied on to fruit. Some growers spray female plants with plant hormones, such as Fruitone, which causes the trees to fruit but the seeds are worthless. Some graft male branches on trees which prove to be males.

PROPAGATION

Seeds. Dr. Wm. Crocker of the Boyce Thompson Institute found that the seeds of *Ilex opaca* are most unusual. The embryo is but slightly developed when the fruit is ripe. In fact, it takes from one to eighteen months after the berry is ripe before the seed is developed enough to germinate.

Low temperature stratification previous to Spring sowing is not the most effective way of producing seedlings. This is true of Christmas Holly (*Ilex opaca*) and of *I. aquifolium* We get very good seedling production from these seeds by cleaning them in the Fall and storing them dry until Spring when we sow them in coldframes, mulching lightly during the Winter. The following Spring gives some seedling production, generally less than 10%. The second Spring gives much higher seedling production often running the total to over 40 per cent. We have produced many thousand seedlings by this method. In one case we kept Christmas Holly seeds in germinators in the laboratory for one and one-half years before sowing them outside in the Spring. The following Spring they produced 66 per cent of seedlings -the highest seedling yield we ever received. This, of course, is not a practical method. When *Ilex verticillata* seeds are sown in the Spring in open coldframes they give good seedling production the following Spring. They do not do so well if mulched during the Winter. It is possible that many germinate under the mulch, the seedlings dying before the removal of the mulch in the Spring. *Ilex vomitoria* seeds will germinate in about nine months.

We have tried many methods of hastening the germination of Ilex seeds including alternation or fluctuating temperatures, a great variety of chemical stimulants and breaking the hard coats. The latter is the only treatment found that hastens the germination and it is not practical. Ives succeeded in greatly hastening the germination of *Ilex opaca* by breaking the coats and growing the seeds in 5 per cent sugar solution, but this also is not a practical method for seedling production.

Layers. To force young shoots, cut the plants to the soil and layer the branches. Heap sandy soil about the plants. When layered in the Spring, they root in the Fall, but they should be left for two Summers.

Grafting. Holly plants are frequently either male or female. It is possible to veneer graft both sexes on the same plant during late Winter.

Cuttings. Until recently the rooting of cuttings of the various sorts of Ilex was considered impossible, but, due to the researches of P. W. Zimmerman and A. E. Hitchcock, *Ilex opaca*, *I. crenata*, *I. glabra*, *I. cornuta* and *I. aquifolium* have been successfully propagated by means of cuttings. I shall quote at length from their report:

In the case of *Ilex opaca*, the percentage of rooting varied according to the source of cutting material. Of four lots taken at the same

time from different trees in Massachusetts the percentage was approximately 40, 60, 80, and 80 per cent, respectively. Even though three types of cuttings were made from each lot the percentage of rooting remained fairly consistent for each tree. Similar results were obtained with material from Maryland and New Jersey.

Rooting was equally good from Aug. 1 to Jan. 1. Results were generally unsatisfactory after Jan. 15 because of frost injury.

Three types of cuttings were tried. Cuttings made of current year stems were slightly better than where old stems remained attached. A 4 in. or 5 in. cutting of current growth plus a portion of two-year-old stem gave satisfactory results. Culls or material 4 in. to 6 in. in length taken at random from stems two to five years old gave a greater variation and a lower percentage of rooting than other types.

Of the five different media used, a mixture of 50 per cent sand with 50 per cent peat moss by volume was generally the best. Rooting was obtained, however, over a pH (acidity reaction) range of 3.6 to 8 in the various media.

Cuttings of evergreen Hollies did not root when all leaves had been removed. *Ilex verticillata*, a deciduous variety, rooted when no leaves were present.

Ilex opaca cuttings started rooting in 21 days, but to obtain a high percentage of rooting it was necessary to leave the material in the medium for three to four months.

Holly cuttings rooted at various temperatures from 59 deg. to 80 deg. F. but for practical purposes 65 deg. to 75 deg. F. was considered a satisfactory range.

Stems of *Ilex opaca* increased in starch and decreased in reducing substances while in the rooting medium. *Ilex crenata* cuttings kept in the dark lost starch regularly for six weeks and did not root. Comparable sets in light increased in starch and formed roots.

Dormant cuttings taken in October produced roots but very few shoots when kept continuously in a warm place. The buds did not develop until after being stored two or more months in a cool place. Many plants lay without top growth throughout the Summer of 1928 but, having been stored in a cool place the following Winter, they made normal growth in the Spring of 1929.

Potted Holly plants (*I. opaca*) when properly selected and pollinated produced crops of berries during the first season.

JACARANDA—Green-ebony

(Jak-ar-an′-da. Jacaranda is a Brazilian name.)

The Jacarandas are trees grown in the Southern States for their large clusters of blue and violet flowers.

Jacaranda ovalifolia (*mimosaefolia*) is a native of Brazil, but grown in California as a worthy street tree. The trees grow 50 ft. high. The

foliage is finely cut and fernlike. It is related to the Trumpetcreeper. The flowers are blue, about 2 in. long, and are produced in loose clusters 8 in. high. The leaves are made up of sixteen or more pairs of pinnae, each pinna having fourteen to twenty pairs of oblong, pointed-tipped, hairy pinnules, and the terminal one has a long point.

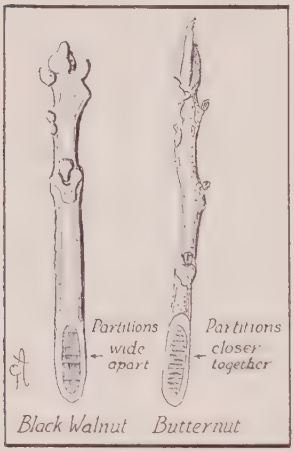
Jacaranda cuspidifolia, unlike the above species, has smooth, not hairy leaves, in which there are only eight to ten pairs of leaflets, which are again divided into ten to fifteen long, narrow, sharp-pointed leaflets, with the secondary rachis winged. The flowers are produced in large terminal clusters and are blue-violet. This species is found in Brazil and also in Argentine.

PROPAGATION. Cuttings of half ripe wood are rooted in Florida.

JUGLANS—Walnut

(Jug′-lans. From *Jovis*, meaning *Jupiter*, and *glans*, meaning acorn.)

This is a group of trees grown for their nuts and timber rather than for their beauty. Refer to chapter on Nut Trees, page 91.



Black Walnut, *Juglans nigra*. The Black Walnut is native from Massachusetts to Florida, west to Minnesota and Texas, and is grown successfully in regions 1, 2, 12, 15, 20, 22, 24, 25, 27 and 28. It grows to be 150 ft. high and has a round head. The bark is deeply furrowed and brown. The twigs are hairy, later becoming smooth, orange to dark brown. The pith is light brown, chambered (18 chambers to a half inch). The leaf scars are rather heart-shaped, not downy at the top. There are fifteen to twenty-three leaflets, ovate oblong to ovate-lanceolate, pointed at the tip and rounded at the base. They are 2½ to 5 in. long and are irregularly toothed. The fruit is ovoid and strongly and irregularly ridged. The husks stain the hands brown. The Black Walnut prefers deep, rich, moist soil. The dark brown wood is used to make the best furniture, interior finishing, musical instruments, boat building, and autos. It is one of the most valuable timber trees. No nut cake is as good as that one made with Black Walnut meats which can also be used to make Black

Walnut butter, which is rarely met with but when once tasted is never forgotten. (See Butternut for comparisons).

Persian Walnut (English Walnut), *Juglans regia.* Native from Southeastern Europe to Himalayas to China. It grows to be 90 ft. tall, and has a broad head. The bark is silvery gray and remains smooth for a long time. The twigs are also smooth. The buds are smooth, and the pith chambers are far apart, eight in a half inch. There are five to nine leaflets, rarely thirteen. They are elliptic to obovate, pointed, generally without teeth, and are 2½ to 4¾ in. long. The leaves emit a strong odor. The fruit is a subglobose and green. The wrinkled nut is edible. They have very deep tap roots. Comparisons: Leaflets of the Persian W. without teeth, while other sorts have teeth.

Butternut (White Walnut) (Oilnut), *Juglans cineria.* This nut is found from New Brunswick to Georgia and west to the Dakotas and Arkansas. Old timers always say that Nature made this nut good enough so that there is no need for improvement. Rehder considers the tree less handsome and less valuable than the Black Walnut. The Butternut usually produces a broad crown and attains a height of 90 ft. The bark is gray and deeply fissured. The twigs are hairy and sticky at first, but later become smooth. They are bitter to the taste and cause the saliva to become yellow. The terminal bud is elongated. The leaf scar is downy at the top and not notched. There are 11 to 19 oblong-lanceolate leaflets 2½ to 5 in. long. They are appressed toothed and hairy above and below. The oblong and ridged fruit is sticky and hairy. The husk of the fruit is used to dye cloth yellow. The Butternut prefers a rich, moist soil. The wood is used for furniture and church altars. This species is not so long lived inasmuch as it is attacked by wood destroying fungus before it becomes aged. In comparison with Black Walnut, the Butternut has a shorter lighter barked trunk; the pith is dark brown; it has larger, longer than broad, more flattened terminal buds; long nuts, and less notched leaf scars.

California Black Walnut, *Juglans californica.* A native of southern California, this tree is advised for regions 1, 2, 3 and 5. The twigs and petioles are hairy. The small leaves are made up of eleven to fifteen leaflets, rarely nineteen, oblong-lanceolate, sharp pointed. The globular husks are thin; the nut is deeply furrowed.

Mexican Walnut, *Juglans rupestris.* A native of Texas, New Mexico and southward. A similar species to *J. californica* which is advised for regions 10, 11, and 14. It is less hairy, more shrubby and has small, narrow leaflets.

FROST cracks are formed by sudden and extreme drop in temperature. The bark cracks open longitudinally every Winter. The crack heals in Summer only to be cracked open again the following Winter. They are not usually dangerous to the life of the tree.—GEO. M. CODDING.

Japanese Walnut, *Juglans sieboldiana.* This species is broad and round and grows to be 60 ft. tall. The twigs are hairy and stout. The pith is partitioned. There are nine to seventeen leaflets, ovate oblong, fine-toothed, 3 to 7 in. long. The leaf scars of the Japanese W. are notched; no notches in the Butternut, which also has long Winter buds.

PROPAGATION

Seeds. Sow the seeds as soon as ripe in a protected place away from squirrels and mice, or stratify them until Spring.

Grafting. See page 150.

KOELREUTERIA—Goldenrain-tree

(Kel-roy-tee′-ri-a. Named for J. G. Koelreuter, professor of Natural History in Karlsruhe 1733-1806.)

This is one of the best medium sized flowering trees in cultivation.

Goldenrain-tree, *Koelreuteria paniculata.* Also known as the Varnishtree, China-tree, and the Pride-of-India. It is native of China, Korea and Japan, and is successfully grown in regions 3, 5, 11, 13, 14, 19 and 20. It is the commonest species of Koelreuteria, is perfectly hardy in the Northern States, and attains a height of 30 ft. The flowers are bright yellow, marked with orange red at the base. They have four petals and are borne in broad, loose panicles 15 in. long, rather like those of the Horsechestnut. Some trees bear flowers of one sex only. The leaves are pinnate or twice pinnate, 15 in. long. There are 7 to 15 three-lobed leaflets, which are round toothed, coarsely and irregularly, often incised at the base. There are bladdery capsules with papery walls changing from light to dark brown, containing three black seeds. The Goldenrain-tree is not particular about its soil, but thrives in extremely alkaline conditions. It prefers to grow in the sun. It withstands drought and hot winds. If the twigs of young trees winterkill, prune them in the Spring. The tree is used for city plantings, but never produces a straight trunk. It is also short-lived.

Some experts would call the Goldenrain-tree, Koelreuteria, one of our best small lawn trees

PROPAGATION

Seeds. Seeds are produced freely. They should be stratified during the Winter and sown in the Spring.

Cuttings. Root cuttings may produce good plants. Softwood cuttings may be taken in the Spring and rooted in coldframes.

Layers. Should be buried in the Fall.

LABURNUM—Golden-chain

(La-bur′-num. The ancient Latin name.)

The Golden-chain trees in some climates are considered shrubs but they often attain a height of 30 ft. They are particularly desirable because of their long racemes of golden-yellow, pealike flowers. Visitors

to English gardens in the Springtime always remember the display made by these popular trees.

Golden-chain (Bean-tree), *Laburnum anagyroides* (*vulgare*). It is a native tree of Southern Europe, and was cultivated in 1560. It grows to be 20 ft. tall. The twigs have appressed hairs and are grayish-green. The yellow flowers are less than 1 in. long and are borne in racemes often 1 in. long. The elliptic leaves are alternate, three-foliate, blunt, and sharp-pointed. They are grayish green, and are silky beneath when young. The tree bears 2 in. pods, with thick keels, and which contains black seeds.

The graceful sprays of golden blossoms and the three-parted leaves of the Goldenchain, Laburnum anagyroides

Scotch Laburnum, *Laburnum (Cytisus) alpinum.* This species is native to Southern Europe and Scotland. It grows to be 30 ft. tall. Compared with *L. anagyroides* it is taller in growth, more upright, hardier; it blooms later, has longer racemes; the leaves are larger, darker but not so downy; the twigs, and pods are smooth. The flowers, fruits and seeds are poisonous.

PROPAGATION

Seeds. Sow the seeds in the Spring. Individual specimens vary greatly in the profusion of bloom. The plant blooms the first year from seed, so that this method is the best.

Suckers. These may be removed from the base of the tree.

Grafting. In England, where the Laburnums are very popular, superior types are budded and grafted on seedlings of the common sort.

Layers. These may be made from the suckers at the base of the tree.

LAGERSTROEMIA—Crapemyrtle

(Lah-gur-stree′-mi-a. Named for Magnus von Lagerstroem, a friend of Linnaeus.)

The flowers of this tree resemble crinkled crepe paper and are so abundantly produced that the shrubby trees are like huge bouquets.

Crapemyrtle, *Lagerstroemia indica.* This tree is hardy as far north as Philadelphia, and attains a height of 10 to 20 ft. It succeeds in regions 1, 2, 3, 5, 29 and 30. The bark is smooth and brown, and the twigs are four-angled. The Winter buds are pointed and have two outer scales. The flowers are pink, purple, or white. They have six petals with crinkled and fringed blades. The leaves are opposite, although the upper ones may be alternate. They have very short petioles Crapemyrtle is very popular in the South.

PROPAGATION

Seeds. Various colors generally come true to seed.

Cuttings. Hardwood cuttings, except the white varieties, in April. Softwood cuttings may be made in the greenhouse in Summer. The white variety is best grown from root cuttings.

LEITNERIA—Corkwood

(Lyt-nehr′-i-a. Named for Dr. E. F. Leitner, naturalist killed during Seminole War in Florida.)

Corkwood, *Leitneria floridana.* Found native from Florida and Texas to Southern Missouri. It grows to be 18 ft. tall. It has an open,

loose head, and the trunk is swollen at the base. The trees are either male or female but not both. They prefer peaty, humid soil. Rehder says that this tree is without ornamental quality. The wood is so light that it is used as floats for fish nets. The lightness of the wood is evident, even in twigs which seem to be featherweight.

PROPAGATION

Suckers. There are frequent suckers which may be removed in the Spring.

LEUCADENDRON—Silvertree

(Leu-kah-den′-dron. This is the Greek for *white tree*. It is the Silvertree of South Africa.)

Silvertree, *Leucadendron argenteum*. Grows to a height of 30 ft. The twigs are densely hairy. The leaves are narrow, 3 to 6 in. long, densely covered on both sides with silvery, silky hairs. The trees bear flowers of one sex only, which are produced in the axils in bracts. The male flowers are numerous. The female flowers are accompanied by woody bracts and aggregated into conelike heads. The fruit is a broad nut. The Silvertree prefers light loam and a warm, sheltered place. These are trees grown only in Southern California or rarely in greenhouses of botanical gardens in the Northern States.

PROPAGATION

Seeds. They are obtained from South Africa and should be sown ¼ in. deep as soon as received. Care should be taken that they are not overwatered.

LIQUIDAMBAR—Sweetgum

(Li-quid-am′-bar. From *liquidus*, meaning *fluid*, and *ambar*, Arabic for *amber*, referring to the fragrant resin from the bark of the oriental species.)

Sweetgum (Bilsted) (Redgum) (Alligatorwood), *Liquidambar styraciflua*. This is a pyramidal, symmetrical, tall and straight tree, 135 ft. tall, and found native from Connecticut to Southern New York, to Florida, Illinois, Missouri, and Mexico, and is grown in regions 25, 28, 29, 30 and 31. The stout branches are red-brown, often corky ridged, although often not. The pointed buds are a shiny reddish-brown, and are fragrant when crushed. The leaves are described as being star-shaped, heart-shaped at the base, and 4 to 7 in. long and wide. They are five to seven lobed, each finely toothed, and lustrous. The leaves are Maplelike, turning crimson, yellow, and orange in the Fall, some changing before others. The fruit is spherical and spiny, persisting

a, bud and leaf scar; b, the winged twig; c, the star-shaped leaf; d, the young twig which has not become winged; e, the spiny, globular seed ball

through the Winter. The Sweetgum prefers a deep, rich soil and will not tolerate shade. It should be transplanted in the Spring and should be pruned severely. It is used as a street or avenue tree, in the park, and as a specimen. The wood is used for boxes, crates, and for furniture. It is a substitute for Circassian Walnut. The resin is used in preparation of chewing gum.

Formosa S., *Liquidambar formosana.* The leaves are three-lobed and turn crimson only.

The Sweetgum produces gloriously colored red leaves in the Autumn

PROPAGATION

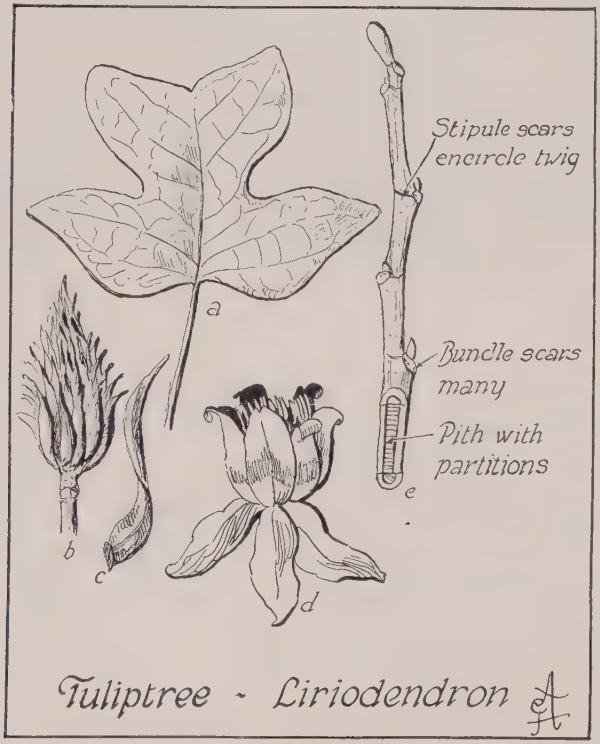
Seeds. Stratify the seed as soon as ripe. Sow in a moist seed bed in Spring. It frequently takes two years for germination.

LIRIODENDRON—Tuliptree

(Lee-ri-o-den'-dron. From the Greek *leirion*, meaning *lily*, and *dendron*, meaning *tree*.)

Tuliptree, *Liriodendron tulipfera*. Also called Saddletree, Canoewood, Whitewood, Yellowpoplar, and Bluepoplar. The Tuliptree is grown successfully in regions 2, 24, 25, 27, 28 and 29. Its tall trunks, destitute of branches, make it attractive in the wild. Next to the

Planetree (Sycamore) it becomes the tallest tree in the Northern States—150 ft. high. The bark is somewhat like Ash but is lighter and has less diamond-shaped furrows. The twigs are smooth, brown, and aromatic. The terminal buds are shaped like a duck's bill. The flowers are tulip-shaped, 2 in. across, greenish white, with orange band at the base. The leaves are saddle-shaped, 3 to 5 in. long, with a broad, truncate apex. The leaf is attached entirely around the stem. The foliage turns yellow in the Fall. The Tuliptree bears rather conelike brown fruit made up of winged seeds. The



a, the distinctive leaf; b, the curious seed cluster; c, one of the winged seeds; d, the flower; e, the twig with the terminal bud resembling a duck's bill, stipule scars which encircle the twig, and the partitions in the pith

The greenish-white flowers of the Tuliptree have a deep orange spot on each petal

tree prefers a deep, rich, moist soil, and is found along streams and in semi-swampy places. It is too large for the average streets. Also the average street in the city does not furnish the proper soil. The wood is used for interior finishing, boats, shingles, brooms, and woodenware. The Indians hollowed canoes from the tree trunks. The Tuliptree is the state flower of Indiana. It often develops spot gall and *Lecanium tulipiferae* scale. Spray with contact insecticides. It should always be balled-and-burlapped when moved, as it is difficult to transplant. In the nursery it should be transplanted every two years in light soil. The trees are most easily transplanted when three years old or younger.

Propagation

Seed. Sow seed as soon as ripe. Transplant often. The seeds have low fertility. Young plants make long succulent roots, so that they must be transplanted for several successive Springs. D. J. Browne in the "Trees of America" says: "It has been observed that for the first ten years of its fruiting, all seeds prove abortive, and in large trees the seeds

from the highest branches are the best." Use inch-long pieces covered lightly by sand on a light soil.

Root cuttings. A method less often used.

MAACKIA

(Mak′-i-a. Named for Richard Maack, Russian naturalist 1825-1886.)

Often considered species of Yellow-wood, or Cladrastis, the Maackias have opposite leaflets whereas Cladrastis has alternate leaflets.

Amur Maackia, *Maackia* (*Cladrastis*) *amurensis*. Grows to be 45 ft. tall but is seldom seen over 20 ft. tall. The buds are prominent in axils of leaves. In Cladrastis they are hidden beneath petiole. The slightly fragrant, pealike flowers are borne in dense, upright racemes, branching at the base. They are white, showing orange red stamens when the keel opens. The leaves are odd-pinnate, with seven to eleven leaflets which are opposite and smaller than those of Cladrastis. In the Fall they drop from the tree without change of color. The tree bears a dry, thin pod. It is not particular as to the soil but it does enjoy a warm, sunny place.

Var. *buergeri*. The leaflets are hairy beneath.

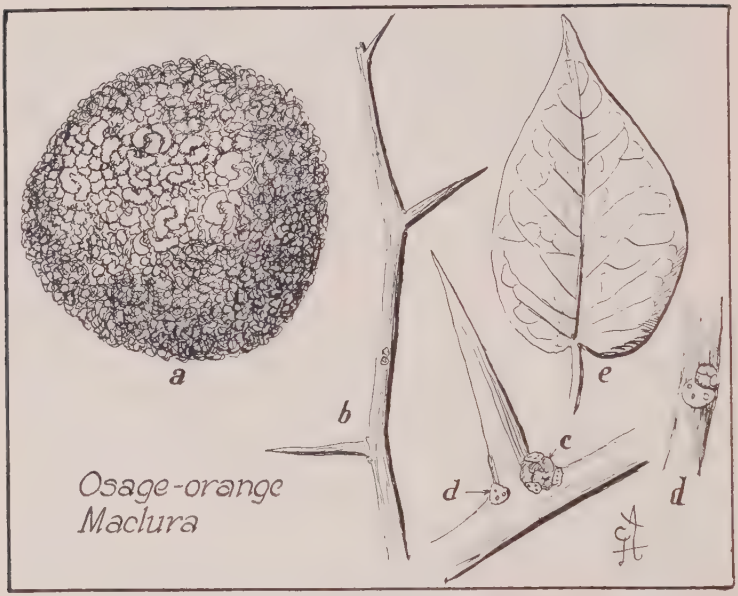
Maackia chinensis. In comparison to *Maackia amurensis*, the leaflets are narrower and more numerous, and the blooms are larger and are produced in more panicled heads.

Propagation. Seed. Sow in the Spring.

MACLURA (Toxylon)—Osage-orange

(Mak′-loor-a. Named for William Maclure, 1763-1840, American geologist.)

Osage-orange (Bow-wood) (Hedge-tree), *Maclura pomifera*. Attains a height of 60 ft. and is grown successfully in regions 16 and 17. The trunk usually has a dense growth of sprouts. The bark is deeply furrowed, and the twigs are light green and spiny, with an orange pith. The leaves are ovate to oblong-lanceolate, 2 to 6 in. long, and lustrous. They turn yellow in the Fall. The tree bears large, fleshy fruit, 4 to 5 in. in diameter, which contains a milky juice and ripens in October. In the Middle West, it is used as a hedge but the thorns make pruning difficult. The fiber is used for paper. The wood is used for fences, bridge piling, police clubs, and tobacco pipes. It was used by the Osage Indians to make hunting bows. Boys play ball with the oranges.



a, the orange-shaped fleshy fruit; b, the zigzag thorny twigs; c, a bud; d, leaf scar; e, leaf

PROPAGATION

Seed. Soak seed in hot water for several days.

Cuttings. Softwood cuttings should be rooted in Summer under glass.

MAGNOLIA

(Mag-noh′-li-a. Named for Pierre Magnol, director of the botanical garden at Montpelier.)

The stateliness in form, the large and rich foliage, and the lavish production of fragrant flowers places the Magnolia in the foremost rank among ornamental trees. It is well to give them a good background of green in order that their flowers may have the proper contrasts. The late John Dunbar, to whom the city of Rochester, New York, will ever be indebted for his service to the magnificent parks of that city, once wrote: "China and Japan have contributed nothing more beautiful than Magnolias. The hybrids which have been de-

veloped many years since from two Chinese species, *Magnolia denudata* and *Magnolia liliflora*, are gems of the first water. In all parts of this country, wherever they prove to be hardy, the fact is indeed a fortunate circumstance. I often think that if these Magnolias had never been introduced from Asia what a serious floral blank we would have in our parks and gardens today."

There are many Magnolias throughout the city of Rochester which are at least 30 ft. in height. On Oxford Street the space in the center, 18 ft. in width, is entirely devoted to Magnolias. The variety is mostly *soulangeana speciosa*. On the particular Sunday when they are in full bloom crowds of people go especially to see them, in much the same way as the Japanese view the Cherry blossoms.

The varieties mentioned by Mr. Dunbar are not the only valuable Magnolias. The first to bloom in the Spring are the shrubby sorts like the Star Magnolia, which is likely to bloom several weeks before the last freezings can be expected. Consequently, they are frequently injured. Following the Star Magnolia comes *Magnolia soulangeana* and various hybrids which range from deep purple to pure white. Later

Left, the Southern Magnolia which bears evergreen leaves, with its cone-like seed pod, characteristic of all Magnolias; right, the Fraser Magnolia which bears leaves eared at the base

on in the season we have the glorious flowers of the Bigleaf Magnolia, the Umbrella Magnolia, and in the South the Southern Magnolia.

The Southern Magnolia has been chosen by the Louisiana legislature and the Mississippi school children as the state flower. The Chinese regard this Magnolia as symbolic of candor and beauty. Where it is hardy, the Southern Magnolia is considered one of the best of all the trees. Its evergreen leaves are gloriously green on top and rusty brown beneath. As one nurseryman expresses it: "It represents the epitome of richness in evergreens." It is found growing as far north as Cincinnati, Ohio. In the Winter, some advise cutting off the leaves of this Magnolia in its northern range.

Botanical characteristics. The terminal buds are large with a single outer scale, bearing a scar above the base. The stipules are attached to the petioles and enclose the young leaf. The scar encircles the stem. The flowers are generally large and are never produced in clusters. The conelike fruit upon maturity opens to release red seeds which are suspended by long thin threads.

A Simple Key to Magnolias in Flower

A. Blooming before leaves.
- B. Color of flower, pure white or nearly so.
  - C. Shape flower, bell-like..... *Magnolia conspicua*, Yulan
  - CC. Shape flower, starlike.
    - D. Petals 9 to 18, pink streaked outside *M. stellata*, Star M.
    - DD. Petals 6, pure white..... *M. kobus*
- BB. Color of flowers, pink to purple.
  - C. Size flower, large, 6 to 10 in.
    - D. Hardy..... *M. soulangeana*, Saucer M.
    - DD. Tender..... *M. campbelli*, Campbell M.
  - CC. Size flower, 3½ in..... *M. liliflora*, Lily M.

AA. Blooming after leaves.
- B. Color flower, greenish..... *M. acuminata*, Cucumbertree
- BB. Color flower, white, conspicuous color at center.
  - C. Petals purple spotted at base *M. macrophylla*, Bigleaf M.
  - CC. Stamens with scarlet filaments.
    - D. Leaves mostly clustered at end of branches *M. hypoleuca*, Silver M.
    - DD. Leaves scattered along branches *M. watsoni*, Watson M.

BBB. Color flowers, pure white.
C. Size of flowers, small 1 to 3 in.
D. Shrub or tree to 70 ft. high
M. virginiana, Sweetbay
DD. Shrub usually 4 to 5 ft. high..... *M. pumila*
CC. Size of flowers, large 6 to 9 in.
D. Foliage evergreen. . *M. grandiflora*, Southern M.
DD. Foliage deciduous.
E. Leaves eared at base. *M. fraseri*, Fraser M.
EE. Leaves not eared at base
M. tripetala, Umbrella M.

SPECIES

Cucumbertree (Mountain Magnolia), *Magnolia acuminata*. Native from New York to Georgia, west to Illinois and Arkansas, and is successfully grown in region 25. It is a rapidly growing tree, attaining a height of 90 ft. in the South, being pyramidal, with an upright growth at first but spreading later. The twigs are downy at first, and the buds are red brown and hairy. The flowers are inconspicuous and rather poor when compared with other Magnolias. They are greenish or yellow, bell-shaped, about 3 in. high. The leaves are elliptical or ovate, thin, 4½ in. long, short-pointed, soft, hairy and light green beneath. The fruits are red and attractive, and when young are supposed to resemble a cucumber. The Cucumbertree does not enjoy shade but does like being in a rich woods.

Variety *cordata*. It is sometimes cataloged as a separate species. It has broader leaves, woolly white below, seldom cordate at base. The flowers are smaller, and are canary yellow. It is found in Georgia.

Yulan (Chandelier, Chinese White M.), *Magnolia denudata* (*conspicua*) (*Yu lan*, Chinese for Lily tree). Native of central China. It is shrubby when young, attaining a height of 45 ft. It forms a round tree with spreading branches, flowering when two to three years old. The twigs and buds are hairy. It bears white flowers, five to six in. long, which appear in great profusion before the leaves. The fragrant flowers have nine petals and sepals which are alike. The leaves are obovate to oblong, 4 to 6 in. long, short-pointed, and taper at the base. The fruit is deep red, cylindrical, curved, and unsymmetrical. It blooms so early that the blossoms are often damaged by frost. The Chinese pickle the flower buds for flavoring rice. To keep it shrubby, prune after flowering. Loudon says that it has been cultivated in China since the year 627 and since that day frequent accounts testify that few gifts were more welcome to the emperor than a potted Magnolia.

In severe Chinese Winters the trunks were wrapped with straw ropes. Chinese poets consider the tree to be the symbol of candor and beauty.

Fraser Magnolia, *Magnolia fraseri*. Grows as far North as New York City, and South to Georgia and Alabama. It attains a height of 30 to 40 ft. It has wide, spreading branches, forming an open head. *M. fraseri* differs from *M. macrophylla* by having smooth, not hairy, leaf buds and twigs, and the leaves are crowded at the ends of the twigs. It blossoms in May or June with a canary yellow flower, 10 in. across, which has a refreshing fragrance. The leaves are eared at the base, 12 in. long, and smooth, grayish beneath. The fruits are rose red.

Southern Magnolia (Bullbay) (Evergreen Magnolia). *Magnolia grandiflora* (*foetida*). This is a pyramidal tree 90 ft. tall, and is successful in regions 29, 30, 31, and 32. It is half hardy and is good only as far North as Kentucky. The bark is gray brown. The twigs and buds are rusty and hairy. The flowers are white, 6 to 8 in. across, cup-shaped, and with a lemon odor. The leaves are evergreen, obovate to oblong, thick, lustrous above, and rusty hairy beneath. The Southern Magnolia prefers being on high rather than low soil, and it must have moisture but be well drained. Not over-fertile soil prevents late growth but gives greater hardiness. Meehan says: "The proximity of a large body of water is most favorable to it, as is also shade from sun in Winter. With protection from high winds, as well, it may be considered hardy at Philadelphia." Some advise Winter defoliation, but with protection it leafs out earlier. It is the state flower of Louisiana and Mississippi.

Silver Magnolia (Japan Magnolia), *Magnolia hypoleuca* (*obovata*). Native of Japan and grows to be 90 ft. tall. The twigs are purplish, smooth, and stout. The flowers are white, cup-shaped, 5 to 6 in. across, with 6 to 9 petals. The leaves are obovate, 8 to 16 in. long, abruptly contracted at the base, purplish tinted above, whitish beneath, with a reddish midrib. The fruit is scarlet. *Magnolia hypoleuca* is similar to *Magnolia tripetala* but is more pyramidal, less open habit, with more showy flowers.

Bigleaf Magnolia (Bigleaf Umbrellatree), *Magnolia macrophylla*. A round-headed tree, growing 45 ft. tall, and native from Kentucky to Florida, west to Arkansas and Louisiana, and is successful in region 25. It is grown successfully as far north as New York City. The bark is smooth and quite light in color. The twigs are hairy at first, and the buds are hairy and compressed. The flowers are creamy white, purplish at the base, and fragrant. They are cup-shaped, have six petals, and are 10 to 12 in. across. The Bigleaf Magnolia has the largest simple leaves of any tree. They are oblong-obovate, rounded at the tip, rather

The leaves of the Bigleaf Magnolia are often 12 to 30 inches long and the flowers are often a foot across

heart-shaped or eared at the base, and 12 to 30 in. long. (*M. tripetala* is pointed at the base.) They are grayish beneath and are clustered at the tip of the branches. The rose-colored fruit is more round and not so conelike as those of *M. tripetala*. It should be situated in a protected place of the large leaves will be whipped by the wind. It also requires a deep, fertile soil. The young trees grow very slowly. Grafting this species is difficult because of the large pith. The flowers are somewhat hidden by the foliage and are often infested with rose bugs. The tree is also short-lived.

Anise M., *Magnolia salicifolia*. A slender tree sometimes attaining a height of 30 ft. The twigs are smooth, and the flower buds are densely hairy. The flowers are white, often purple at the base outside, and

A splendid tree of the Saucer Magnolia, Magnolia soulangeana

they are fragrant. They are 4 to 5 in. across, and have narrow petals, six sometimes thirteen. The leaves are somewhat Willowlike, elliptic-ovate to oblong-lanceolate, 3 to 5 in. long, and sharp-pointed. They have twelve pairs of veins, and are grayish and often a trifle hairy beneath.

Saucer M., *Magnolia soulangeana* (*M. denudata* × *M. liliflora*). This is a large shrub, bearing purplish or rose flowers which are sometimes fragrant. The flowers are campanulate, 4 to 6 in. across, with sepals half as long as the petals. The leaves are obovate and downy beneath. *Magnolia soulangeana* is rarely pruned except to slightly improve the shape. The best time for pruning is in June. The blooms are often damaged by frost in the Spring. It was raised at Fromont, near Paris, at the Chateau Soulange-Bodin. It resembles *M. liliflora*, in which the sepals are small and greenish, not petal-like, and the petals are always purple.

Variety *lennei*. The flowers are rosy purple outside and white inside. The sepals are more narrow and more pale. It is of bushy habit and often flowers a second time.

Variety *rustica*. The flowers are more rose red. The tree is of a more vigorous growth.

Variety *spectabilis* and *alba*. The flowers are white, tinged with purple outside towards the base.

Variety *alexandrina*. Has large white flowers, and makes a large bush. Earlier than the type.

Variety *norbertiana*. A vigorous tree of regular outline, with white flowers shaded light purple.

Variety *purpurea*. Produces stout branches; purple flowers creamy white inside.

Variety *speciosa*. A smaller and lighter tree than the type, blossoming a week later, and remaining in good condition longer than the others.

Star Magnolia, *Magnolia stellata* (*halliana*). This is a shrub or tree with wide-spreading branches, a native of Japan, but plants forty years old are not over 12 ft. tall and as broad as high. The twigs and buds are densely downy. The fragrant flowers are white or streaked faintly with pink. The blossoms, 3 in. across, appear before the leaves. The flowers have twelve or more petals, and the sepals are narrow. The leaves are obovate, and are dull green above. They are quite small in comparison with the other Magnolias. The fruit is 2 in. long, twisted, and with only a few fertile carpels. The Star Magnolia must be grown in a sheltered position. It blooms at a young age and is one of the first Magnolias to bloom in the season.

Variety *rosea*. The flowers are fragrant and the petals are suffused outside with pink. This variety is a wide-branched, spreading shrub.

Umbrella Magnolia (Elkwood), *Magnolia tripetala* (*umbrella*). This species is wild from Pennsylvania to Alabama, west to Arkansas and Mississippi, and grows to be 36 ft. tall. The bark is light gray and is smooth, marked with small warts. The branches grow nearly horizontal and then upward. The buds and twigs are smooth. The terminal buds are large, up to 2 in. long, and are purple. The white flowers have a heavy fragrance, are 7 to 10 in. across, and have six to nine petals when young. The leaves are disposed in the form of an umbrella. The leaves are oblong to obovate, 10 to 24 in. long, pointed at both ends, and are downy beneath. They are clustered at the tips of the twigs and radiate out like spokes of an umbrella. The fruit is rose-colored, large cones, often 4 in. long, made up of numerous divisions which split in the Fall. The Umbrella Magnolia grows best in swampy soil along streams and tolerates shade. The young trees are seldom straight unless they are staked. Sow the seeds as soon as ripe, otherwise they become rancid, says Loudon.

Sweetbay (Swampbay) (Small Magnolia), *Magnolia virginiana* (*glauca*). Also called Beavertree because the root is eaten by beavers. It has been used as baits in traps for them. Michaux says the beavers use the wood to build their dams. The Sweetbay is a deciduous shrub or half evergreen, with a trunk usually crooked, growing 4 to 24 ft. tall, 70 to 80 ft. in the South, and found native in Massachusetts to Florida and Texas. The bark is a grayish-brown, and the twigs are green, becoming brownish. The buds are downy. The fragrant white flowers are like those of a Waterlily, and are produced continuous from June to August. They are solitary, 2 to 3 in. across, with nine to twelve petals. In the South the leaves are evergreen, the old leaves remaining until the new crop is produced. They are glossy above, and beneath are covered with a grayish substance which rubs off. The leaves are oval, 3 to 6 in. long. The fruit is 2 to 2½ in. long, ellipsoid, and red. It is associated in Nature with the Red Maple and Andromeda. It prefers swampy soil. Many persons advise a deep pit around the plant to hold the rain and for watering in time of drought. For Winter fill the hole with leaves. The Sweetbay will prosper because the roots will be cool and there will be plenty of food. Consequently, it is best to transplant it just as the flowers open, for it is too soon otherwise. Young trees, 4 to 5 ft. tall, are taken from the swamp in early Spring and are transplanted. The bark and roots have been used medicinally for years. It is used as a substi-

Left, the white flower of the Watson Magnolia, whose center is filled with numerous crimson stamens. Right, the lovely, snowy flower of the Silver Magnolia, M. hypoleuca, which is five to six inches across

tute for quinine. Instead of dropping after they have faded, the flowers are held on the plant.

Variety *longifolia.* The leaves are lanceolate.

Watson Magnolia, *Magnolia watsoni.* This Magnolia grows to be 25 ft. tall. The twigs are smooth. The flowers are white, with pink sepals and crimson stamens and carpels. They are large, being 5 to 6 in. across, are drooping and cup-shaped, with six petals, and are fragrant. The leaves are obovate to oblong-obovate, 4 to 7 in. long, round pointed, ten to fifteen pairs of veins, and are grayish and finely hairy beneath. The fruit is oblong. The flowers are considered handsome because of the crimson stamens and pistils.

Magnolia parviflora is similar to *Magnolia watsoni*, but *M. parviflora* has hairy twigs and petioles.

Pruning. Magnolias are slow to heal when branches are removed, so that pruning is rarely done except to remove branches which spoil the symmetry of the tree. Such pruning as is done should be practiced while the plants are in growing condition rather than in the Winter. Careful gardeners train Magnolias and pinch out unruly

shoots when they are still young and green. By this method they retain the symmetry of the plants.

Transplanting. The four statements made in "The Book of Shrubs" relative to transplanting Magnolias will bear repetition:

1. The roots of the Magnolias are very soft and are destroyed either by exposure to the air or injury when the plants are dug in such a way that the roots are torn from the soil rather than dug. If the roots are not dug carefully the layers are separated and are permanently injured. Dig the plants as carefully as possible. Each root should be cut but should not be pried in the slightest degree. Careless digging results in the roots' dying back, so that it is better to cut each root back to healthy wood rather than to leave injured surfaces to decay.

2. Transplant *Magnolia soulangeana* when in full flower. The roots are then active and will heal over and not die back.

3. If you move them any distance, be sure to raise the ball of earth with burlap and keep it moist. When they are purchased, the order should state definitely that they should be balled-and-burlaped.

4. Never tramp the soil round the roots in planting for fear that the roots will be injured. Water the soil in around the roots. If the soil will not stand this, it needs drainage, which if not provided will cause lack of success in your Magnolias anyway.

Propagation

Seeds. Gather seeds when ripe, because the seed is inclosed in a fleshy fruit which is rather resinous inside and soon becomes infected with a fungus. For that reason it is wise to remove the pulp before decay can set in. It is not uncommon to find upon examination that the entire embryo of the Magnolia seed is destroyed by fungus. To remove the pulp, soak the seeds for a few days in pure water or water to which a little washing soda or wood ashes have been added, after which the pulp can be removed by rubbing between the hands or through a sieve. It may be well to then treat the seeds with one of the disinfectants containing mercury compounds. Sow the seed in frames or flats in the Fall. Germination should take place in the Spring. Then, as soon as the second leaf appears, they should be potted in small pots. Repot when necessary. Transplant only in the Spring when the growth starts. The true species are raised from seed, as are also stocks to be used in grafting.

The seeds of the Cucumbertree should be stratified for 150 days at 36 to 40 degs. (N. Y. State Conserv. Dept.), or 120 to 150 days at 50 degs. (Chadwick).

Cuttings. Knight, at Kew (England) selected cuttings in late June and July inserted in a frame, at a temperature of 70 to 75 degs., in pure sand. Water with rain water at the same temperature as the air. Small branches are used rather than the young tips of longer branches. Use a small heel because an exposed pith rots and continues to spread up the stem.

Watkins rooted 80 percent of cuttings of *Magnolia soulangeana* by using 40 percent indolebutyric acid as compared to none in the check.—Fla. Exp. Sta. Bullt. 347. Scholz reports similar results.

Layers. Many of the Magnolias are layered, using last year's growth, which in the Spring is notched or tongued. Do not sever the layers from the parent plant until they are thoroughly rooted, and remove them only on a dull day. Place them in pots and keep them in a coldframe in which the heat can be well confined until they are thoroughly rooted. Then give air gradually until they stand full air without wilting. They may also be propagated by mound layers, in which case the plants are cut down in early Spring and layering is done as soon as the new growth is of sufficient size.

Grafting. Cucumbertree and Umbrella Magnolia are readily raised from seed and are the common stock for grafting *Magnolia soulangeana.* The side or veneer grafting is used upon potted seedlings kept in the greenhouse, the most successful time being in February or March. Some growers use long scions over a foot long.

MALUS (Pyrus)—Apple

(May′-lus.)

The Apple is a tree which is so dear to the hearts of most home owners that no word of appreciation could add to the sentiment which surrounds its blossoms in Springtime, its shade in Summer, and its fruit for the Winter evening. Throughout the ages the Apple has ever been one of the choicest fruits, but it is an ornamental tree that we shall consider it in this book.

The ornamental Crabs are generally not as large trees as the common Apple, but their branches are wreathed with bloom so thick that foliage cannot be seen. Sometimes the fruit also possesses great beauty, though few of them are edible. Many of the ornamental species resemble the common Apple in the form of the tree. In most cases it is a flattened oval, with a wider spread of branches than the tree grows in height. The Germans have a lovely poem describing the Apple tree as a wayside inn. May I quote a free translation of this poem:

The Wayside Inn — An Apple Tree

I halted at a pleasant inn,
  As I my way was wending,
A golden apple was the sign,
  From a knotty bow depending.

Mine host—it was an apple tree—
  He smilingly received me,
And spread his choicest, sweetest fruit
  To strengthen and relieve me.

Full many a little feathered guest
  Came through his branches springing;
They hopped and flew from spray to spray,
  Their notes of gladness singing.

Beneath his shade I laid me down,
  And slumber sweet possessed me;
The soft wind blowing through the leaves
  With whispers low caressed me.

And when I rose and would have paid
  My host so open-hearted,
He only shook his lofty head,
  I blessed him and departed.

Foliage Key

By Ralph W. Curtis*

1. Wood just beneath the bark of the twig purple; also the flesh of the fruit.....2
1. Plant not as above.....3
2. Leaves glossy above, smaller and narrower; fruit half as large (½ in. long, ⅝ in. wide)..... *M. purpurea*, Purple Crab
2. Leaves duller above, larger and wider; fruit twice as large (1 in. long and 1¼ in. wide).....*M. niedzwetzkyana*, Redvein Crab
3. Side veins run straight to the teeth at the margin of the leaf.....4
3. Side veins curve and branch and fade away before reaching the margin of the leaf (anastomosing)..... 5
4. Leaves of flowering twigs woolly beneath; those of the end shoots more so and thicker and more strongly veined..*M. ioensis plena*, Bechtel Crab

* This study was begun at the Arnold Arboretum in 1930, continued at the Rochester parks in July, 1931, and completed at the Arnold Arboretum, August 18, 1931. Reprinted from the *Florists Exchange and Horticultural Trade World* as a presentation before the Eastern Association of Nurserymen.

4. Plant not as above.....7
5. Leaves glaucous beneath (bluish like the bloom on grapes)..... *M. glaucescens*, Dunbar Crab
5. Leaves green beneath.....6
6. Leaves of flowering twigs wider (ovate to ovate-oblong); fruit larger (sometimes twice as wide) and ribbed at the blossom end.... *M. coronaria*, Wild Sweet Crab

   Note. Here will come the double variety called *M. coronaria charlottae.*

6. Leaves of flowering twigs more narrow, usually oblong; fruit smaller and not ribbed at the blossom end. . *M. angustifolia*, Southern Crab
7. Leaves lobed, sometimes only on the shoots.....8
7. Leaves not lobed.....11
8. Most of the leaves with three to five lobes.....9
8. Most of the leaves are toothed, but some on the shoots are three-lobed.....10
9. Fruit larger and more handsome, yellow with a red cheek and covered with a blue-gray waxy bloom; habit of growth open and graceful, making an arching, foutainlike crown..... *M. toringoides*, Cutleaf Crab
9. Fruit smaller, either red or brownish yellow; habit of growth, low, dense and spreading.....*M. sieboldi*, Toringo Crab
10. Leaves dull above; plant is low and spreading; twice as wide as high, the lowest of the Crabs.....*M. sargenti*, Sargent Crab
10. Leaves glossy above, plant is broad and rounded in form, resembling *M. floribunda* but with more lively foliage..... *M. atrosanguinea*, Carmine Crab
11. Calyx persistent.....12
11. Calyx deciduous (shedding).....14
12. Leaves wider (*i. e.*, ovate) with rather coarse, sharp teeth..... *M. scheideckeri*, Scheidecker Crab
12. Leaves more narrow (*i. e.*, elliptical to elliptic-oblong) with small appressed teeth.....13
13. Leaves firm and more glossy above....*M. micromalus*, Midget Crab
13. Leaves not as above. .*M. spectabilis riversi*, Double Pink Chinese Crab
14. One-year-old twigs, petioles, midveins beneath and fruits are reddish-purple; the fruits are very small, on long stems which stand out stiffly from the twig; leaves quite glossy and very firm and leathery *M. halliana parkmani*, Parkman Crab
14. Plant not as above.....15
15. Leaves glossy above.....16
15. Leaves not glossy above.....17
16. Leaves also glossy beneath; fruits smaller and without a cavity at the base; habit of growth very irregular and picturesque.... *M. theifera*, Tea Crab
16. Leaves not so glossy beneath; fruits are larger and with a cavity at the base; habit of growth upright. .*M. micromalus*, Midget Crab
17. Leaves larger and wider; fruits are larger, about ½ in. across, yellow *M. arnoldiana*, Arnold Crab
17. Leaves smaller and more narrow; fruits are ¼ to ⅓ in. across *M. floribunda*, Japanese Flowering Crab

Species According to Season of Bloom*

Malus angustifolia (late 3)
arnoldiana (1)
atrosanguinea (1)
baccata var. *mandshurica* (1½)
coronaria (1½)
floribunda (1)
halliana (1)
ioensis var. *bechteli* (3)
Malus micromalus (1)
parkmani (1)
prunifolia var. *rinki* (1½)
pumila var. *niedzwetzkyana* (1½)
robusta (1½)
sargenti (1½)
spectabilis (1½)
theifera (1)

A few other sorts are found on page 63.

1. Arnold Crab (*Malus* or *Pyrus arnoldiana*) (*M. baccata* × *M. floribunda*). This beautiful sort originated at the Arnold Arboretum. It has rose-colored flowers, larger than *M. floribunda*, which fade white. The flowers are produced on long, drooping stems. It is a low spreading tree with long, arching branches. The fruit is yellow.

2. Bechtel Crab (*M. ioensis* var.). This is a natural sport producing double flowers, found by Bechtel, a nurseryman near Staunton, Illinois. Its large double pink, roselike flowers, its round buds, and its great profusion of bloom year after year has endeared this small, bushy tree to the hearts and gardens of America. The foliage is shallowly lobed and always attractive. There is a feeling that this sort should not be grafted or budded upon the Common Apple as the trees are shorter lived. Seedlings of *M. ioensis*, or some other native sort, are best.

3. Carmine Crab (*M. atrosanguinea*) (*M. halliana* × *M. sieboldi*). This sort has redder buds than *M. floribunda*, purplish in tone, opening red instead of white. Fruit reddish-yellow. Hicks suggests it as a substitute for the pink Magnolia, which is rare. It blooms about the same time.

4. Cherry Crab (*M. robusta*) (*M. baccata* × *M. prunifolia*). Very early. Flowers white, fragrant. A handsome tree. Fruits 1 in. across, dull red.

5. Chinese Apple (*M. prunifolia* var. *rinki*). Large white flowers. Fruit red, yellow and green, 1½ in. in diameter. Cultivated in China for fruit. Fruit remains for a long period of time.

6. Chinese Flowering Crab (*M. spectabilis*). A tall shrubby sort. Flowers pink, fragrant, semi-double. Fruit not showy, pale yellow, not large. Leaves smooth and shining.

*To A. E. Wohlert, of Narberth, Pa., I am indebted for the facts as to season of bloom. He writes, "Indicate them as 1 and 1½ for earliness, and 3 as late, as there is a gap between the early and late and really no midseason."

The Japanese Flowering Crab, Malus floribunda, is one of the choicest lawn trees when its branches are wreathed with soft pink blossoms

7. Japanese Flowering Crab (*M. floribunda*). One of the handsomest and most reliable. A small tree, round topped, with single flowers. The buds are carmine but change to pink, then white. The fruit is the size of a Pea and red. Stands cold and drought. Tremendously profuse blooming.

8. Manchurian Crab (*M. baccata* var. *mandschurica*). Early. Flowers pure white, large and fragrant. Fruit dark purple on long stems.

9. Midget Crab (*M. micromalus*). Early. Flowers pale pink, buds tiny, deeper color. Fruit yellow. Habit pyramidal. Also called Kaido Crab. (Hybrid between *M. spectabilis* × *M. baccata*.)

10. Parkman Crab (*M. halliana*). Small, dark green leaves, remaining until late. Flowers very double; bud dark rose opening rosy white. Fruit size of pea, reddish. Favorite in Japanese gardens.

11. Redvein Crab (*M. pumila* var. *niedzwetzkyana*). The variety name is one of no beauty and great length. The leaves are brownish-red, smooth and shining. The fruit, flowers, twigs and all parts have a cast of red.

12. Sargent Crab (*M. sargenti*). A low, hardy sort. Flowers white, stamens golden. Fruit scarlet, hanging until Spring. The fruit alone serves to make this one of the most desirable.

13. Scheidecker Crab (*M. scheideckeri*). Flowers semi-double, pink; buds red. Fruit yellow. Small tree of pyramidal habit. The flowers are in "bottlebrush formation along the stems." This sort may be forced in the greenhouse.

14. Siberian Crab (*M. baccata*). Very hardy, tall, narrow tree. Flowers white. Fruit red or yellow, size of a cherry.

15. Southern Crab (*M. angustifolia*). Open tree, 30 ft. tall. Bright pink flowers, latest to bloom. Branches rigid and spiny. The fruit is flattish, yellow-green. The leaves are slightly lobed.

16. Tea Crab (*M. theifera*). Lovely tree bearing numerous clusters of flowers which are rose-red in bud and pale when expanded. The yellow fruits serve to make this plant appear to be in bloom in Winter.

17. Wild Sweet Crab (*M. coronaria*). Flowers blush-colored, fragrant. Branches thorny. Fruit yellow, hard. Native Canada to Maryland. Not as profuse blooming, but fragrant.

Uses. Such small trees as the Crabs are always more useful for home grounds than the larger trees. Among flowering trees, the Crabs are the largest group, giving a glorious succession of bloom. They serve as specimens for the background of extensive shrub borders.

A. E. Wohlert recommends the Crabs for tall hedges, pointing out that the foliage is good, that there are few insect pests to contend

with, that they will flower and are hardy. It is suggested that the pruning for hedge purposes may be done in May or early June and again a month later. This assures a crop of bloom. For this purpose, *M. atrosanguinea*, *M. floribunda*, *M. arnoldiana*, and *M. scheideckeri* may be used. The hedge may be kept at 4 ft. or allowed to attain a height of 20 ft.

Soil. Most sorts will thrive in the stony, poorer soils.

Pruning. Except to start them in the way they should grow, there is little difficult pruning necessary. See that the first few branches are evenly spaced around and up the trunk, pruning as little as possible. Most sorts bloom when quite young. The pruning of mature trees should be for the purpose of retaining a good form and attempting to renew the wood.

Propagation

Prof. L. C. Chadwick has supplied this note: 1. The Flowering Crabs are best propagated by whip grafting on to Apple seedling roots in January or February. The stocks are dug in the Fall and stored until used. Six- or eight-inch cions should be used on about 3 in. root pieces. The unions are tied with waxed string and the grafts are stored over Winter like hardwood cuttings, or in graft boxes, packed in moist peat or sawdust in narrow rows, and lined out in a similar way in the Spring. If set deep in the soil, many of them develop their own roots.

2. The species, not hybrids, may be raised from seed; namely, *M. spectabilis*, *M. theifera*, *M. floribunda*, *M. sargenti*, *M. coronaria*, and *M. baccata*.

The various species of ornamental Crabs and Pears need a period of after-ripening before the seeds germinate readily. The Boyce Thompson Institute advises a temperature of 41 degrees for a period of from 60 to 100 days for germination. See page 139. Of course, many of the varieties of the ornamental Crabs are semi-double and fully double so that they produce no seeds.

3. Budding. Many of the sorts may be budded upon common Apple stocks in mid-July or later.

FREDERICK CRANEFIELD once said: "Talk to a city council about the beauty and majesty of a tree, recite Joyce Kilmer's poem and you waste your time; talk about the value of trees in dollars and cents and you will win."

MELIA—Chinaberry, Texas Umbrella-tree

(Mee'-li-a. From *meli,* meaning *honey,* and is the Greek name for Manna-ash, which one species resembles.)

Chinaberry
Melia

Chinaberry, *Melia azedarach.* Commonly called the Pride-of-China, the Beadtree, and the Indian-lilac, Because the seeds are used for rosaries, it has been also called the Paternoster-tree. Along the Grecian Archipelago it is commonly planted near monasteries for that purpose. The species name *azedarach* means "a tree of preeminence." The Melia makes rapid growth and produces very dense shade. It has a hemispherical head, which grows 30 to 40 ft. tall. It is hardy only from Virginia south and is highly successful in California, except very near the coast, and is also successful in regions, 3, 5, 11, 16 and 17. The flowers are lilac, similar to those of the Catalpa, and are borne in axillary clusters at the tips of shoots. The leaves are twice pinnate. The fruit is yellowish, with a brownish nut, surrounded by a sweetish pulp which is eaten by birds. *Melia azedarach* prefers a warm, loamy or dry, sandy soil. The tree has a formal round appearance and is one of the most popular shade trees in California. The berries and flowers are used as stimulants. Beads are made from the seeds, which are dyed various colors. The tree is not bothered by insects. If placed in an unprotected place, the winds will whip the leaves and destroy the symmetry of the tree.

Variety *umbraculiformis,* the Texas Umbrella-tree, has narrower leaflets and erect branches which with the drooping foliage gives an umbrella effect.

Propagation

Seeds. Sow seed as soon as ripe. It grows easily.

Cuttings. Softwood cuttings may be rooted under glass, and hardwood cuttings are successful.

THE relative popularity of trees planted in Philadelphia as street trees, according to S. N. Baxter, is:

London Planetree	*1008*	*Sugar Maple*	*103*
Norway Maple	*695*	*Linden*	*53*
Red Oak	*300*	*Ginkgo*	*49*
Pin Oak	*130*	*Black Locust*	*49*

and others in lesser numbers

The Texas Umbrella-tree, Melia azedarach, is a popular subtropical tree which one sees commonly in Texas

MORUS—Mulberry

(Mor′-us. Ancient Latin name of the plant.)

a, Bud of the Black Mulberry, Morus rubra; b, bud of the White Mulberry, Morus alba, tightly pressed against the twig; c, the fruit; d, the varying forms of the White Mulberry leaf

Lee S. Goode characterizes the Mulberry as the knave of trees, and adds that it is mussy, due to its juicy fruits, which are constantly dropping, and that "the tree is always full of squalling birds."

The Chinese were the first to cultivate the Mulberry for silkworms. They discovered the art of silk making in 2700 B. C., in the reign of Empress Si-ling-chi, who observed the silkworms, collected them and fed them. She noted that they thrived better in cultivation, the cocoons being larger. The traders carried silk through all of Asia. Alexander the Great introduced the knowledge of silk to the Greeks about 350 B. C. At that time no one knew the source of the silk. Some supposed it to be the hair of certain trees. Another story circulated was that it was the entrails of a spider fed with paste till it burst with fat. From Greece the use of silk passed to Rome. Tiberius passed an edict prohibiting its use by men because it was effeminate. The silken sails of Cleopatra were perhaps her most elegant possession when she visited Alexandria. It is said that in 220 A. D. a silk robe was worth its weight in gold.

In the sixth century two monks smuggled eggs of silkworms to the court of Justinian at Constantinople. They had them concealed in hollow canes. From this beginning, silkworm culture spread through Greece. It is thought that the milkiness of the sap of the Mulberry imparts the quality to silk such as other milkless trees would not. The history of silk through the ages and the culture of silkworms is

well told in "Trees of America," by D. J. Browne, and also in J. C. Loudon's "Arboretum and Fruticetum," Vol. III, pages 1350-1355.

White Mulberry (Silkworm Mulberry), *Morus alba*. This tree, with its wide spreading limbs and round head, is a native of China, and grows to be 45 ft. tall. When cut on warm days the bark is milky. The twigs are often slightly hairy at first, becoming smooth. They are swollen at the nodes and are sweetish when chewed. The leaves are triangular, pointed at the tip, rounded or heart-shaped at the base, smooth, and often variously lobed. They are nearly smooth beneath, and hairy on veins. The tree leafs out late. The fruit is white, pink, or purplish-violet, and is insipidly sweet. It appears July to August. The White Mulberry is happiest in a rich, moist soil. It is the chief food of the silkworm. The wood is used for fence posts and boat building. Because of the attraction of the fruit for birds, it is useful as a protection for the Cherry orchards.

Red Mulberry, *Morus rubra*, has darker twigs; larger shining, greenish to brown buds with dark margined scales. The leaves are broad, heart-shaped, 4 to 6 in. long, finely toothed, and rough above. The fruit is dark red, almost purple.

PROPAGATION

Seed. The commoner Mulberries may all be raised from seed. Wash them from the pulp, and keep them cool and dry until Spring. Then sow. They may also be sown in the Fall.

Cuttings. Hardwood cuttings of White Mulberries root easily.

Grafting. The weeping varieties are grafted at a height of 5 to 6 ft. in early April. See illustration, page 152.

NYSSA—Tupelo (Sourgum)

(Nis′-sa. Named for Nyssa, a water nymph who educated Bacchus.)

Tupelo (Upland Yellowgum) (Pepperidge) (Blackgum) (Sourgum), *Nyssa sylvatica* (*multiflora*). Native from Maine, Ontario and Michigan to Florida and Texas, and is successful in regions 24, 25, 27, 28 and 29. It grows to be 60 ft. tall. The bark is thick, light brown, often tinged red, and in appearance the tree is broad and flat-topped, while others are tall, and still others are squatty. The branches are more numerous than on other native trees, and are slender, horizontal, or pendulous. The buds are dark red-brown. The pith is woody partitioned. The leaves are obovate to elliptical, 2 to 5 in. long, acute to acuminate, rather coarsely dentate, shining above, and gray beneath. They turn red early in August. The fruits are blue-black, borne on long stems. They are bitter until frost, after which the birds eat them. The

Tupelo will be found along the sides of streams and in low, wet places. It is associated with the White Oak, Tuliptree, Sugar Maple, Cucumbertree, Ash, Buckeye, and Baldcypress. The wood is used to make hubs of wheels, boxes, chopping bowls, and baskets. The branches are easily broken in the wind. It is difficult to transplant, for instead of forming fibers, the roots go down.

PROPAGATION

Seed. Collect the seeds and sow them in the Autumn or store them in sand until Spring. Do not let them dry out. It usually takes one year for the seeds to germinate. The trees self-sow their seeds in the wild, and they may be purchased as collected seedlings.

Layers. They may be rooted.

OSTRYA—Hophornbeam

(Os-try'-a. Greek name of tree with hardwood or from *ostryos,* a scale in reference to the scaly catkins.)

a, The zigzag twigs bearing catkins; b, the bud; c, the hoplike fruit; d, the leaf, which is doubly toothed

American Hophornbeam (Ironwood) (Leverwood) (Deerwood), *Ostrya virginiana.* Native from Cape Breton, Ontario and Minnesota to Florida and Texas. The American Hophornbeam is round-headed, reaching a height of 60 ft. The bark is brown, with thin flakes broken into narrow, flattish pieces. The tree resembles a young Elm, but the bark has more narrow flakes and the bundle scars of the twigs are not sunken. The twigs are slender. There are catkins in groups of three at the end of the twigs. The leaves are 2 to 4½ in. long, are a trifle heart-shaped at the base and turn yellow in the Fall. The attractive fruit is hoplike, being a ribbed nutlet inclosed in individual, bladderlike pods

An acid loving tree, the Sourwood has leaves like those of a Peach which turn red in the Autumn

which have rigid hairs at the base. It is found on dry gravelly slopes, and occasionally in moist places. It tolerates shade.

PROPAGATION

Seeds. Sow as soon as ripe, or stratify them.

OXYDENDRUM—Sourwood

(Ox-i-den'-drum. Named from *oxys*, meaning *sour*, and *dendron* meaning *tree;* referring to the acid flavor of the leaves.)

The Sourwood is a tree found native to acid soil regions and is noteworthy for its attractive scarlet Autumn tints.

Sourwood (Sorrel-tree), *Oxydendrum* (*Oxydendron*) *arboreum*. The Sourwood has a narrow-topped crown and attains a height of 75 ft. but is usually 15 to 20 ft. tall. The flowers are urn-shaped, whitish, borne in terminal panicles of six or more racemes. The leaves are much like Peach leaves, being alternate, elliptic-oblong, 3 to 8 in. long, broad at the tip and wedge-shaped at the base. They are lustrous, turning scarlet in the Fall. The fruits are grayish capsules, persistent and conspicuous in the Winter. The Sourwoods are used as specimens and as background for shrubbery. To make it treelike, remove the lower branches and extra shoots.

PROPAGATION

Seeds. May be obtained from collectors, and sown in flats. The seed beds should be shaded and kept very moist until they germinate. They make very slow growth when young. As this is an acid-soil plant, we would suggest sowing the seeds in peatmoss.

PALIURUS—Christ-thorn (Jerusalem-thorn)

(Pal-i-eur′-us. Name derived from *pallo*, to move, and *ouron*, urine; in allusion to its diuretic qualities; or from Paliurus, the name of a town in Africa, or an ancient Greek name.)

The Christ-thorn, *Paliurus aculeatus*, is a native of Southern Europe and North and West Asia. Because of its abundance in Judea, it has been considered as the original crown of thorns.

It is a low tree or tall shrub, and attains a height of 20 ft. The flowers are yellowish-green, in crowded clusters. The twigs are hairy and spiny; the foliage is alternate, ovate, toothed, smooth, 3-nerved, with two spines at the base, one of which is straight and the other curved. The fruit is flat and thin, papery, somewhat like the crown of a hat; therefore, the French call it *Porte chapeau*. Because of its spiny nature, it is used commonly as a hedge in Italy. It is also planted in the warmer regions of California and our Southern States.

PARKINSONIA—Jerusalem-thorn

(Park-in-soh′-ni-a. Named for John Parkinson, the botanical author of "Paradisus in Sole Terrestris.")

Parkinsonia aculeata, generally called the Jerusalem-thorn, but other names given to it are Bigota, Palo verde, Ratama, and Horse-bean. It is a small tree growing 10 ft. tall, and is grown in regions 10, 11, 17 and 32. The branches are slender, zigzag, and often pendulous. The leaves are bipinnate, spiny-tipped, and the leaflets are 8 to 16 in. long, with flattened, twiglike, long, narrow sections. The flow-

ers are yellow, produced in drooping clusters, 3 to 6 in. long; the foliage is feathery. It is particularly recommended for dry, frost-free regions. It is one of the leguminous plants.

PROPAGATION. May be propagated by seeds or by cuttings of half-ripe shoots.

PAULOWNIA—(Empresstree)

(Paul-oh′-ni-a. Named for Anna Paulowna, princess of the Netherlands.)

Royal Paulownia (Empresstree), *Paulownia tomentosa* (*imperialis*). The Royal Paulownia is a round-headed tree, growing 45 ft. tall, and native to China and Japan, though it has escaped and grows in Southern New York to Georgia. The flowers are often Winter-killed in the North. The stout branches are spreading, and the twigs are densely soft hairy when young. There are two buds, almost sunken in the bark, one above another, in the axil of the leaf. The flowers appear before the leaves, and are pale-violet with dark spots and yellow stripes inside, and with a very good fragrance. They are borne in terminal panicles, 8 to 12 in. long, tubular funnelform. The leaves are opposite, broadly triangular, 5 to 10 in. long or often 20 in. long on strong shoots, heart-shaped and often shallowly three-lobed. They are densely hairy beneath, and resemble those of the Catalpa. The capsules are ovoid, beaked, woody, and open in two halves, showing many flat, winged seeds. The Royal Paulownia prefers a deep, light loam and tolerates salt air. It should be sheltered from the cold winds. Nurserymen take up young plants and store them in storage house. Samuel Newman Baxter says to wrap them with newspapers for the first few years of their growth. They are tender and bloom before they leaf out. They need pruning every year. The tree will tolerate city conditions, there being one near Independence Square, Philadelphia. It is sometimes grown as a herbaceous plant.

Empress-tree Paulownia

PROPAGATION

Seeds. Sow seed in the Spring.

Root cuttings. Root cuttings should be 3 in. long. They root easily inasmuch as this plant is one of the suckering sorts.

Leaf cuttings. Ernest Braunton says that the leaves may be cut off and inserted in sand under a bell-jar.

The Royal Paulownia bears pale violet flowers which resemble those of the Catalpa

PHELLODENDRON—Corktree

(Fel-oh-den'-dron. Name derived from *phellos*, meaning *cork*, and *dendron*, meaning *tree;* referring to the corky bark of the type species.)

Amur Corktree, *Phellodendron amurense*. Grows to be 45 ft. tall. The bark is light gray and corky. The wood is aromatic. The buds are small and naked, inclosed by the base of the petiole. The twigs are light gray or yellowish-gray. Bears small, yellowish-green flowers.

The leaves are opposite, odd pinnate, 5 to 13 pinnae, and are almost transparently dotted. They turn yellow in the Fall. Ailanthus leaves are similar to them. The black, drupe fruits remain on the tree after the leaves have fallen.

Sakhalin Corktree, *Phellodendron sachalinense.* Native of Korea, Japan, and Western China. Rehder says that it is the hardiest and most satisfactory sort for cultivation. The tree has a tall trunk, attaining a height of 45 ft., and a broad crown. The bark is dark brown, fissured end broken into thin plates. The mature twigs are reddish-brown. The flowers are yellow-green. There are seven to eleven Ashlike leaflets, which are aromatic, and which turn yellow. They are ovate to ovate-oblong, pointed at the tip, and rounded or wedge-shaped at the base. The berries are black with a turpentine odor. *Phellodendron sachalinense* thrives well in a dry soil, and is resistant to the heat. It is free from pests.

Corktree
Phellodendron sachalinense

PROPAGATION

Seeds. They are produced freely and germinate readily when sown in the Fall.

Cuttings. These may be taken in July. Root cuttings may be dug in the Fall and stored in sand or sphagnum moss to be planted in the Spring.

PLANERA—Water-elm (Planertree)

(Pla-ner′-a. Named in honor of J. J. Planer, professor of botany at Erfurt.)

Planera aquatica is the common species, and grows abundantly in swamps on the borders of the rivers in Georgia.

It is an Elmlike tree which grows to a height of 40 ft. It is native from Southern Illinois to Florida and Texas, but it is not hardy in the Northern States and is seldom cultivated. The tree forms a low, broad head and is often confused with the Elm. The leaves are smaller than most Elm leaves and coarsely toothed. In the case of the Elm, most of the leaves are doubly toothed.

PLATANUS—Planetree (Buttonball) (Sycamore)

(Pla′-tan-us. Derived from the ancient Greek form *platys,* ample or broad, in allusion to its spreading branches and abundant foliage.)

The Planetree is very frequently called the Sycamore in the United States, but this is not a good name to use, inasmuch as the

English call the Sycamore Maple a Sycamore, but the true Sycamore is a species of Fig.

The Planetrees are very large, deciduous trees, with bark which scales off in hard irregular pieces. They are native of the United States, Eastern Europe, Western Asia and Northern Africa. The leaves are large and resemble those of the Maple, but the base of each leaf stem is hollow and fits over the bud which will expand next year. The fruit of the tree is a ball, hanging from the tree by long threads in Winter. The flowers are so small that we seldom notice them.

Planetrees, and especially the American Planetree and the London Plane, are splendid strong trees, due to the fact that they tolerate city smoke, drought and difficult city conditions.

Loudon relates an interesting, story about the Oriental Planetree. According to Herodotus, Xerxes, when he invaded Greece, became so fascinated with the Oriental Planetree that he encircled it with a collar of gold and passed an entire day under its shade, compelling his whole army to encamp in its neighborhood, and that the delay on this occasion was one of the causes of his defeat. Evelyn adds to this story, telling us that Xerxes became so fond of this tree that he covered it with gold, gems, scarfs and riches.

SPECIES

American Planetree (Buttonwood) (Buttonball) (Sycamore) *Platanus occidentalis*. Native south to Florida and Texas, and from Maine to Ontario and Minnesota, and is successful in regions 2, 16, 19, 20, 22, 24, 25, 27, 28, 29 and 30. It is round-headed, perhaps the tallest deciduous tree of North America, being 120 ft. tall, and occasionally 150 ft., and often has several trunks. The leaves are straight across to heart-shaped, 4 to 9 in. wide, often broader than long, three- to five-lobed, with shallow spaces between lobes, generally coarsely toothed, though sometimes smooth. The petioles have a hollow base, fitting over the buds. The bark is almost creamy-white and peels off in rather small plates which are dark brown and fissured in old trunks. The twigs are stout and zigzag, enlarged at the nodes, at first green and hairy, but later turning brownish, to gray and smooth. The heads are made up of solitary, hairy, one-seeded fruits. The American Planetree is used for shade and for a street tree. It is difficult to split, so that the wood is used for tobacco boxes, crates, butcher's blocks, furniture and charcoal. It prefers a moist, fertile soil, but grows in dry soil.

Oriental Planetree, *Platanus orientalis*. It is 90 ft. tall, with a broad, round head. The leaves are broad, wedge-shaped or nearly straight base. They are 4 to 8 in. wide, five to seven lobes, with the space between the lobes reaching to or below the middle. The bark

comes off in thin layers, dull-grayish or greenish-white. The globular fruits are produced in clusters of two to four, thereby differing from *Platanus occidentalis.*

London Planetree, *Platanus acerifolia.* (*P. occidentalis* × *P. orientalis*). It is more commonly planted than true Oriental Planetree, and is sold as such by some American nurseries. It is successful in regions 1, 6, 20, 24, 25, 27-30. It attains a height of 100 ft. The leaves are straight across to heart-shaped, 5 to 10 in. wide, three- to five-lobed, triangular-ovate to broad, triangular lobes, the spaces between the lobes running to one-third of the blade and sometimes sparingly toothed. The London Planetree is used as a street tree, whether wide or narrow, and is less subject to disease than the other sorts. It does not suffer in dust and smoke and tolerates severe pruning.

The leaves and fruits of the London Planetree, one of the most tolerant of trees

California Planetree (California Sycamore), *Platanus racemosa.* It flourishes in regions 1 and 3, and is good along whole Pacific Coast. It grows to be 90 ft. tall. There are two to seven seed heads to a stem. The leaves are 3 to 5 in. broad with deep, smooth lobes, and hairy beneath.

Sycamore blight. This disease is often widespread and damaging, but can be controlled by spraying with bordeaux mixture and burning the leaves and diseased twigs and branches. Frequent Spring rains favor the development and spread of this disease.

Curtis May, assistant in plant pathology at the Ohio Agricultural Experiment Station, finds that the disease is caused by the parasite *Gnomonia veneta* growing in the tissues of the leaves and twigs. The parasite lives over Winter on the fallen Sycamore leaves and in cankers on the twigs and small branches.

Spores, produced in the Spring on these leaves and cankers, infect the developing green parts of the tree. When the disease is bad it may

THE tallest trees are ones first struck by lightning. Sound trees are less often struck than those with rotten wood. The Oak is particularly susceptible to lightning. In a German forest one Beech was struck to sixty Oaks.

entirely defoliate the trees. In most cases the trees will recover and put out new leaves later in the season. If defoliation occurs in two or more consecutive seasons the tree may be killed.

The disease may be controlled by raking and burning all the leaves in the Fall and cutting out and burning all diseased twigs and branches. Many twigs will be missed in the Fall, but they can be detected and removed as soon as the tree begins to leaf out in the Spring.

In addition to these sanitary measures, the trees may be sprayed with bordeaux mixture 4-4-50 to protect the young leaves. The spray is applied after the buds burst but before the leaves are half grown. This is followed by a second application in about a week, and if the season is rainy, two more applications at intervals of two weeks.

PROPAGATION

Seeds. Sow them in the Fall and expose them to freezing.

Cuttings. Hardwood cuttings may be taken in Autumn but seldom more than 75 per cent of the London Planetree root.

POINCIANA (Delonix)—Royal Poinciana (Barbados-pride) (Flamboyant) (Barbados Flowerfence)

(Poin-si-an′-a. Named for Mons. de Poinci, governor of the Antilles in the seventeenth century.)

Visitors to Florida usually return to the Northern States exclaiming upon the great beauty of the Royal Poinciana, the flowers of which are orange and scarlet, borne among the very graceful, fernlike leaves.

Poinciana (*Delonix*) *regia* is a widely branched, spreading tree, growing to be 30 to 40 ft. tall. Although this plant is related to the Sweet Pea, the flowers are not pea-like but are made up of large clusters of scarlet and yellow flowers. The leaves are twice pinnate, 2 ft. long. The pods are often 6 in. to 2 ft. long, and 2 in. broad. These trees are natives of Madagascar but are planted in frostless countries, such as Southern Florida, Southern California, Bermuda and the tropics. They blossom in Summer.

PROPAGATION

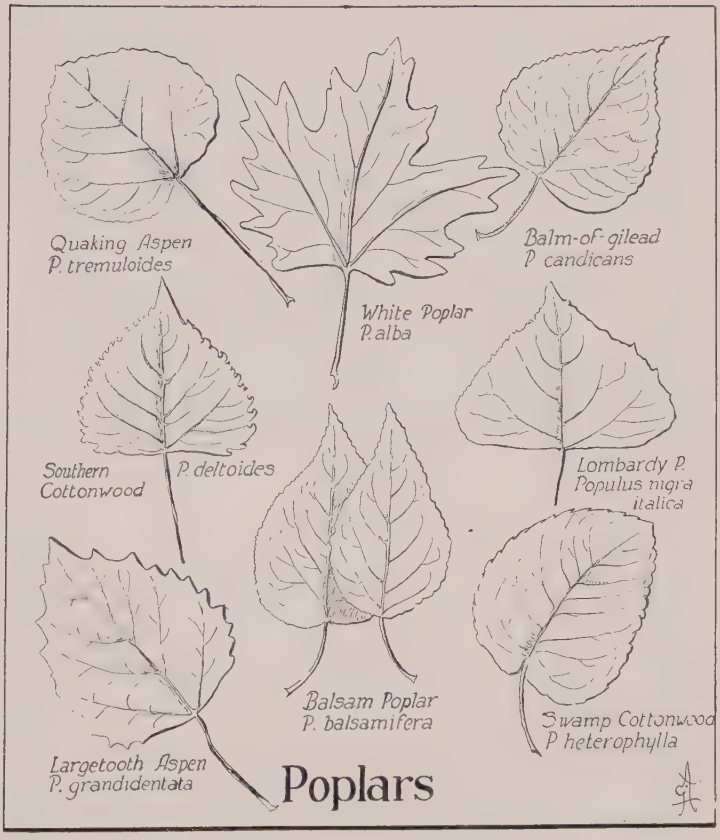
Seeds. Sown in Spring.

Cuttings. Made in the Fall and kept in coldframes for the Winter.

POPULUS—Poplar, Aspen

(Pop′-eu-lus. Some suppose the name to be derived from *pallo* or *paipallo*, to vibrate or shake. Others say that it has attained its name from its use, in ancient times, to decorate public places, where it was called the *arbor populi*, the tree of the people. And Bullet says that the leaves, like people, are easily agitated.)

These are generally large trees of rapid growth. Because of flattened petioles, the leaves of many of the species tremble. The flowers are of one sex only. The catkins are large and produced abundantly in early Spring. The seeds are surrounded by a feathery or cottony down which in some cases is so abundant as to completely cover the soil when it is shed from the trees.



SPECIES

Smoothbark Cottonwood. *Populus acuminata.* Native from Saskatchewan to Colorado, and successful in regions 9 and 12. It grows to 45 ft. tall, and has rhombic-lanceolate leaves, 4 in. long, with a wedge-shaped base, glossy dark-green above and light beneath.

White Poplar (Silver Poplar) (Abele), *Populus alba.* It is successful in regions 7, 12, 16 and 17. It is of irregular habit, with the branches bending up, out and down, and attains a height of 60 ft. The leaves are alternate, ovate, palmately three to five-lobed, each triangular but vary in shape, though most are coarsely toothed, and they have white, matted hair beneath. The bark is whitish-gray, smooth, although rough at the base. The branches are greenish-gray and retain their light color longer than other species. The branchlets and buds have white, matted hair, which can be rubbed off. The pith is five-pointed and star-shaped. Because of its irregular shape, it breaks the monotony of round-topped trees. It is good on steep hillsides as it has roots at surface and binds the soil. The wood is difficult to split or ignite, so that it is used in Europe for rollers, packing cases and flooring. It is always the first tree planted in treeless regions. However, it does sucker too freely. The ancients said that the tree was consecrated to time, the white underside of the leaves represented day, and the almost black upper surface typified night. The leaves of *Populus tomentosa* less deeply lobed, up to 9 in. long; the leaves of *Populus canescens* not lobed, up to 4 in. long.

Variety Bolleana Poplar. *P. bolleana* (*pyramidalis*). Very popular columnar tree. The leaves are more disk-shaped than the type.

Narrowleaf Cottonwood. *Populus angustifolia* (*fortissima*). Native from Saskatchewan to Arizona, and successful in regions 9, 12 and 19. It grows to be 60 ft. tall and has lanceolate leaves, 4 in. long, with rounded or wedge-shaped base.

Balsam Poplar. *Populus balsamifera* (*tacamhacca*). (Incorrectly called Balm-of-Gilead, which is *Populus candicans.*) It is successful in regions 7, 12 and 15, has ascending branches and gets to be 90 ft. high. It has thick, firm, ovate to ovate-lanceolate leaves, pointed, rounded at the base, shallowly round-saw-toothed, $2\frac{3}{4}$ to 5 in. long, and whitish beneath. The buds are sticky, pointed, elongated, and fragrant. The wood is used for pails, boxes and paper pulp. They scent the air with a balsam odor.

Variety *michauxi.* The leaves are slightly heart-shaped or rounded at the base, pubescent on veins, petioles and branchlets.

Balm-of-Gilead Poplar, *Populus candicans.* Bailey says that it is probably a hybrid of European origin. It is successful in regions 12

The Bolleana Poplar with its pyramidal growth and its gray leaves supplies a vertical accent at the side of this driveway

and 26. It has a broad, irregular top, and grows to be 90 ft. high. The leaves are triangular-oval, 6½ in. long, 4 in. wide, with a heart-shaped base, and whitish and hairy beneath. It has many root sprouts and is short-lived. The buds, like the Balsam Poplar, are covered with a gum.

Carolina Poplar, *Populus deltoides* var. *eugenei* (*canadensis*) (*Populus balsamifera* × *Populus nigra*). It is successful in regions 3, 7, 9, 11-19 and 22. The leaves are triangular, pointed, with a straight base, shallowly round-saw-toothed, and flattened petioles. The branchlets are stout and yellowish, with prominent ridges from buds running down the twig. The buds are sticky and quite flattened. The wood is used for paper pulp and for boxes. The Carolina Poplar prefers

rich, moist soil, and is found on the banks of streams, borders of lakes, and in semi-swamp regions. It needs constant heading in, but, of course, this destroys the shape. It suckers freely and the roots lift pavements and clog drains. It should be prohibited for use as a city tree. It also drops its leaves all Summer. When the wood is used as lumber, it warps badly. The twigs of Lombardy Poplar are more slender and buds are more typically appressed. Divergent buds do occur on Lombardy Poplar but not characteristically.

Fremont Cottonwood, Western Cottonwood, *Populus fremonti*. Native from California to Arizona, and successful in regions 9 and 19. It is useful in the Southwest. It has a large head and attains a height of 90 ft. The leaves are triangular, 2½ in. long, 3 in. wide, slightly heart-shaped or straight at the base, glossy above. The branches are stout and drooping on the ends.

Largetooth Aspen, *Populus grandidentata* (*graeca*). Native from Nova Scotia to Ontario and Minnesota, south to North Carolina and Tennessee, Illinois and Iowa. It grows to be 60 ft. high and has a narrow, round-topped head. The leaves are on long shoots, ovate, pointed, with coarse, wavy, sharp unequal teeth; or with callous-sharp-pointed teeth, grayish beneath. The branchlets are rather stout, gray-hairy at first, becoming reddish-orange-brown. The buds are ovoid and grayish-hairy. The wood is used for paper, excelsior and woodenware. It suckers freely. It resembles *Populus tremuloides*, for which see below.

Petrovski Poplar, *Populus laurifolia*. Native to Siberia and found successful in region 9. It attains a height of 45 ft., and has elliptic-oval to lance-shaped leaves, rounded at the base, and whitish or hairy beneath. It withstands drought and cold.

Variety *lindleyana* (*salicifolia*). It has more narrow leaves, and wavy margins.

Lombardy Poplar, *Populus nigra* var. *italica*. It grows to be 100 ft. tall, with a narrow, columnar head and buttressed, tapering trunk, and branches extending from the soil. The leaves are narrowly wedge-shaped. Its pyramidal growth makes it Nature's exclamation point. However, it is subject to blight, suckers freely, and is short lived. See Carolina Poplar for resemblances.

Simon Poplar, *Populus simoni*. Native to China. It grows to be 36 ft. high, and has rhombic-ovate leaves, 5 in. long, 3 in. wide, rounded at the base, pale or whitish beneath. The branchlets are slender, angular and glabrous. The buds are pointed.

Variety *fastigiata*. It is narrowly pyramidal, with slightly angled twigs.

Quaking Aspen (Small-tooth Aspen) (American Aspen) (Popple), *Populus tremuloides*. It is successful in regions 7, 10, 11, 12 and 26. It becomes 90 ft. high, but generally smaller. The leaves are thin, ovate to disk-shaped, short-pointed, finely toothed, with flattened petioles which cause the leaves to tremble in a breeze. It has ever been the simile for writers who wish to express perpetual motion. The trunk tapers gradually into the top of the tree. The young branchlets are reddish-brown, slender and shining. It has a star-shaped pith. The buds are ovoid pointed, a bit sticky, not fragrant, and appressed toward the tips. It is one of the first trees to take burnt-over land. The wood is used for paper pulp, excelsior, lard pails and wooden dishes. It is a poor tree to cultivate because of its abundant suckers, and the roots which are near the surface, destroy the sod.

This avenue of Lombardy Poplars in Rochester, N. Y., is noted throughout the United States

It resembles *Populus grandidentata* in habit and bark, but the buds of this are thicker, dull, dusty appearing and more or less gray downy. The Carolina and Lombardy Poplars have yellow twigs; in the Quaking Aspen they are reddish-brown.

Western Balsam Poplar (Black Cottonwood), *Populus trichocarpa*. Native from Alaska to Southern California, and is successful in regions 7 and 12. It grows to be 180 ft. high. The leaves are broad oval, 5 to 10 in. long, rounded or straight at the base, whitish or rusty beneath.

Poplar Canker. Lombardy Poplars are fast disappearing from Eastern Pennsylvania because of an imported disease—Poplar canker. It kills off limbs and branches, making the trees very unsightly. Eventually they succumb to its ravages. In addition to the Lombardy Poplar, others infected are Bolle, Balsam, Carolina, and Japanese Poplars and the Cottonwood. Remove the infected branches to prevent its spreading.

P. T. Barnes writes that substitutes for the Lombardy Poplar are being propagated, such as the pyramidal form of the Sugar Maple, English Oak, and Tuliptree, which are proving very desirable. The Maidenhair-tree (*Ginkgo biloba*) and the Katsura-tree (*Cercidiphyllum*) may also be used as substitutes.

Propagation

Seeds. They should be sown as soon as ripe. Plant them shallow and keep them rather moist.

Cuttings. Hardwood cuttings are successful with most species.

PROSOPIS—Mesquite

(Proh-soph′-is. From the ancient name of the Burdock.)

In the arid regions of Southern California and the Southwest, we have a number of thorny shrubs, which with irrigation and good soil become trees 60 ft. tall. The sweetish pods, which are related to the Locust, are eaten by cattle.

Prosopis glandulosa. Mesquite. Native from Texas, New Mexico, southern California and Mexico, and successful in region 17. It is a shrub or tree, sometimes being only 9 to 20 ft. high and seldom reaching 60 ft. The flowers are greenish-yellow, pealike, axillary spikes. The leaves are twice feather-formed. The tree has somewhat sickle-shaped pods. It is used in arid regions for honey and forage.

Propagation. Seeds grow readily.

PRUNUS—Cherry, Plum, Peach

(Proon'-us. *Prunus* is the ancient Latin name of the Plum.)

THE CHERRIES

Legend and History

The late Ernest H. Wilson in "America's Greatest Garden" has this to say about the legend and history of the Japanese Cherry tree:

According to Japanese folklore the Cherry tree itself was a lovely princess named Konohama Sakura, reincarnate, the color of the petals being that of the blushes which diffused the cheeks of this bewitching damsel. From this pretty legend is derived the name Sakura or Zakura, now universally applied to the Cherry tree in Japan. Today throughout the length and breadth of Japan, Cherries are planted and growing in temple grounds, parks and courtyards, in palace gardens and in the gardens of the humble cottagers as well as along the roadsides and streets of the greater cities. In the immediate vicinity of Tokyo it is estimated there are 50,000 of these trees.

According to one Japanese authority the double flowered varieties have been known for fully a thousand years and the single varieties were favorites long before them. Yet another Japanese authority, Miyoshi, tells of the first collections brought together in about the year 1800 and of various other collections from time to time later and of one of 78 varieties consisting of 1000 trees in 1886. The first introduction into England seems to have been in 1822, a single tree with double white flowers. In the United States the first recorded introduction was in March, 1862, when George Roger Hall brought in 15 varieties. There is no record of these existing now. In 1890 seeds of one single flowered variety were sent to the Arnold Arboretum. The trees from these seeds are still thriving among the Arboretum's many later beautiful introductions.

Probably the best known and most popular collection, however, is in Potomac Park, Washington, D. C. In 1912, Miss Eliza Scidmore, a well known authority on Japanese subjects, and the Japanese consul, Dr. Takamine, met with Mrs. William Howard Taft, then first lady of the land. These ladies must have entertained the consul royally, for the city of Tokyo immediately thereafter presented the City of Washington with 2000 flowering Cherry trees of 12 varieties. Eight hundred of these were planted in an almost unbroken circle around the Tidal Basin, and the other eleven varieties were planted along the East and West drives.

If you ask when is the best time to visit our National Capital, eight out of ten Washingtonians, according to Paul Russell, will reply: "Come when the Japanese Cherry trees are in bloom." There are three miles of them and Mr. Russell tells us in *American Forests:* "These trees when in flower are one of Washington's showiest places." And

they have made themselves perfectly at home, which leads to the query, will America Americanize the Japanese Cherry tree? Why not? The flowering Cherry in its varied forms is closely interwoven with the national customs and literature of the Japanese people. The development and gathering together of the many distinctive and beautiful varieties is one of their proudest horticultural achievements. If these varieties are adapted to the soils and climates of considerable areas of the United States, why, indeed, should we not make the most of a tree so remarkably beautiful and outstanding in its decorative artistry? Mr. Russell also says in regard to proper settings: "Not only for lining avenues or parkways, but wherever possible in parks and private grounds with evergreens for a background or among evergreens, thus affording the greatest possible contrast for deep pink, delicate pink or white flowers in early Spring when many of the broad-leaved trees are bare.

We may gather from all this that we may beautify our yards with these distinctive trees as well as our over-sea gardeners have theirs, provided these trees will withstand the varied climates of our states. Wherever the fruit Cherry will thrive most of the Japanese Cherries will also. They have proven hardy at the Arnold Arboretum in Eastern Massachusetts, where probably the proximity of the ocean tempers the climate in Winter, and at Highland Park, Rochester, N. Y., where the influence of Lake Ontario may also temper the extreme cold. But here is an example of hardiness from Japan. The *Yama Zakura* (Mountain Cherry) of Northern Japan, is the parent of many of the finest, double flowered varieties. Mr. Wilson tells us this Cherry is more abundant than elsewhere in Hokkaido, the northern island of Japan, and is also found in Saghalien, off the coast of Siberia. Probably this Cherry will stand any cold we may produce. How well its double flowered children will stand colder climates than those mentioned in Massachusetts and New York, I am unable to state at present, but they are all exceedingly prolific on the Pacific Coast.

Species

Oriental Cherry (The so-called Japanese Flowering Cherries are mostly derived from this species), *Prunus serrulata*. It is 75 ft. high, and bears white, non-fragrant flowers. The leaves are ovate to ovate-lanceolate, $2\frac{1}{4}$ to $4\frac{3}{4}$ in. long. They are abruptly long-pointed, saw-toothed or doubly saw-toothed, with short, bristle-tipped teeth, greenish-brown when unfolding and grayish beneath. The bark is smooth, dark chestnut brown. The twigs are smooth. The fruits are the size of a pea and black.

Varieties of Cherries

For the benefit of those desiring a rather extensive description of the varieties derived from *Prunus serrulata*, the writer is indebted to

The Weeping Cherry is one of the most graceful of weeping trees

Paul Russell, in "Japanese Flowering Cherries," U. S. D. A. Circular 31:

Double Pink

Ichiyo, sometimes known as Hisakura. One of the earliest to bloom. Light pink double flowers, about 1¾ in. across, in clusters of three. With age the color becomes almost white, contrasting attractively with the bronze-colored young foliage.

Fugenzo (James H. Veitch) (Kofugen). Probably the oldest cultivated variety. It develops into a large, stout, spreading tree about 35 ft. high, probably the largest of the double varieties, and its light pink flowers, about 1⅞ in. wide, are in clusters of three or four.

Shirofugen. A closely related variety differing only in its lighter colored flowers. In both of these the buds are deep pink, with one or two green leafy carpels projecting, and the young foliage is bronze green.

Kwanzan (Kanzan) (Sekizan) (Sekiyama). One of the latest to bloom and probably the finest variety. The tree is upright in habit and becomes about 25 ft. high. The truncate red buds show the projecting leafy carpels, as in Fugenzo, and the deep pink flowers, about 2 in. across, are independent clusters of three or four.

Kirin. Closely resembling Kwansan, but blooming slightly later and with the flower clusters more erect, likewise an excellent variety.

Yedozakura. Late blooming, light pink flowers, less double than Kwanzan. The petals are slightly wrinkled and paler toward the center of the flower.

Fukurokuju. A striking variety, has a rather stiff, upright habit, with a rounded compact crown. Its pale pink flowers, nearly 2 in. across, are in threes and fours, with the clusters crowded toward the ends of the branches in a characteristic and attractive manner. The young foliage is bronze-green.

Amanogawa. The fastigiate habit reminds one of the Lombardy Poplar, together with its large, delicate pink, fragrant flowers, less double than those of Fukurokuju, making it one of the most ornamental of the double pink group.

Yaemurasaki. In the deep pink color of its flowers it resembles Kwanzan, but its flowers are only semi-double.

Ojochin. A variety with very pale, nearly white flowers about 2 in. across. This is very attractive with its large, loose flower clusters. The young foliage is brown.

Gyoiko is a curious variety, odd rather than beautiful, with semi-double, cream-colored flowers marked with greenish stripes and narrow red lines along the centers of the petals. With age these flowers become more or less uniformly pink and the young foliage is greenish-brown.

Double White

Shirotae (Mount Fuji). This is the best representative of the group. It has large double or semi-double fragrant flowers, about 1½ in. wide, in short-stemmed clusters of two to five.

Amayadori has pendent clusters of slightly smaller flowers which usually are faintly tinged with pink on the tips of the petals.

Single Pink

Mikurumagaeshi. The young foliage, bronze-green, deep pink pointed buds, and flowers in drooping clusters of two to four. These are single, or nearly so, white with a pink tinge, and nearly 2 in. across. The Japanese name means "returning the carriage," referring to a tradition that one of the early emperors passed by the tree and was so impressed that he returned to view it again.

Ariake, which signifies "dawn" in Japanese, resembles closely Mikurumagaeshi, but has lighter, slightly smaller, almost white flowers and is more inclined to have a few extra petals.

The exquisite beauty of the double flowering Cherries can be judged by this spray of flowers

Yama Cherry (Yamasakura) var. *sachalinensis* (*Prunus sargenti*). In this group should also be included the northern form of Yamasakura, which is hardy and long lived, developing under favorable circumstances into a large and shapely tree, 80 ft. or more in height. The single pink flowers are 1½ in. across and the leaves are bronze-green when young, becoming yellow and crimson in Autumn. Botanically the leaves have sharp, but not bristle-tipped teeth.

Single White

Takinioi, which means "fragrant waterfall" in Japanese, is possibly the finest representative of the single white group. The tree is low and spreading, the buds, with pink tinge, and the very fragrant flowers, 1¼ in. wide, are freely borne in clusters of three and four.

Shirayuki. Generally similar but with inodorous flowers and developing into a larger tree of upright habit. Buds show a pink tinge. This variety is usually one of the earliest to bloom, closely following Yoshino.

Wild Black Cherry, *Prunus serotina*. Native from Nova Scotia west to the Rockies and south to Florida. It grows to be 100 ft. tall, and bears white racemes, 4 to 6 in. long, when the leaves are half grown, in April to June. The leaves are oblong or oval, 2 to 6 in. long, shining above, and turn yellow, orange or garnet in the Fall. The bark is reddish-brown, marked with horizontal lines and rough, warty growths. The twigs are smooth. The birds love the purple-black fruits, which ripen in late Summer. The fruits are also used for making jellies. The nectars were formerly fermented, which gave names such as Rum Cherry and Whisky Cherry. The wood is used for furniture, tools and implement handles.

Siebold Cherry, Naden, Takasago, *Prunus sieboldi*. This is a small, erect tree, attaining only 15 ft. It has pink, varying to white flowers, with a red-brown and hairy calyx. They are double or semi-double, 1½ in. across, and are in clusters of three to six. The leaves are densely gray and hairy, but resemble *Prunus serrulata*. The bark is smooth gray, the branches are stout, and the twigs are purple-red.

Higan Cherry (pronounced he-gahn), Equinox Cherry, Rosebud Cherry, *Prunus subhirtella*. This is a much branched, low, bushy species, 30 ft. high, with a short and thick trunk. It blooms the earliest, and completely hides the branches with its light pink single blossoms, with two to five petals with shallow notch at the apex. The leaves are ovate to oblong ovate, 1 to 2¾ in. long, pointed, sharply and often doubly saw-toothed, with ten pairs of veins. The young branchlets are hairy, at first gray but changing to brown-purple. The fruits are black and are not delicious.

The Nanking Cherry, Prunus tomentosa, has extremely ornamental red fruits.

Var. *ascendens*, Benihigan Cherry (pronounced bay-knee-hee-gahn). It is 60 ft. high, with its scarce branches spreading horizontally. The leaves are elliptic-oblong, 2¼ to 4 in. long. It is considered by Wilson as the type of the species. It is the least attractive but makes a rapid growth and so is used as stock.

Var. *pendula*, Shidarehigan Cherry (pronounced she-dah-re-hee-gahn). It has slender, pendulous branches. The leaves are similar to *ascendens* but broader. A tree in Kyoto is said to be 300 years old. The degree of weeping varies greatly.

Nanking Cherry, *Prunus tomentosa*. Native to Northern and Western China, and cultivated in 1870. With its wide spreading,

rounded outline, it is ornamental in flowers and fruits. It is a small tree, only 5 ft. high, but is extremely hardy. The flowers are white with a reddish calyx. They are not ornamental but appear very early, before the leaves. The leaves are crowded, hairy beneath when young, dull, broad oval, wrinkled, deeply toothed, and resistant to insects and disease. The twigs are hairy. The Cherries are small, red, but have the true Cherry flavor. They make good jells but keep poorly. The fruits are thin skinned and drop suddenly. Nanking Cherry should succeed in the cold Northwest.

Yoshino Cherry, *Prunus yedoensis*. Some authorities claim it a hybrid between *Prunus subhirtella* × *Prunus serrulata*. There are about 800 trees in the Tidal Basin, Washington, and 50,000 in Tokyo. It has a broad crown, wide spreading, and attains 45 ft. There are pale pink blossoms, in clusters of two to five in late March or early April. The leaves are hairy beneath, on veins, and on petioles. The bark is smooth, pale gray. The small fruits are a shining black. The Yoshino Cherry provides a good background.

Variety *perpendens*. This is a pendulous variety.

THE PLUMS

Wild Red Plum, Wild Yellow Plum, *Prunus americana*. Native from the Atlantic Coast west to the Rockies and south to the Gulf of Mexico. It is spreading, almost pendulous, and attaining 35 ft. It blooms in April and May. The leaves are oval, 3 to 5 in. long, $1\frac{1}{2}$ in. wide, sharply toothed, paler beneath. The reddish or yellow fruits ripen in August to October. It is found in the open woods and on the borders of streams, but can be naturalized. Dr. Showalter in the *National Geographic Magazine* writes:

With a flower as fair as any that blooms, even though it is but a small blossom, and fruit that, with its rare transparent coloring, is the soul of beauty, the Wild Yellow or Red Plum has a host of friends who rate it high in the order of things delightful to the eye.

This Plum is a genuine American, having dwelt here even before the legendary Norsemen came to these shores. And it is of such sturdy stock that it has been widely used to give new life and to infuse new hardiness into the effete Plums that have come to us on the wings of commerce from Europe.

Since the scientists have become masters of the art of cross-breeding trees and plants, they have learned to couple the hardy, self reliant, disease resisting traits of the wild species with the improved fruit producing traits of the tame varieties that have come to it through centuries of selection. In that way they have given us a long list of new and improved plants.

The wild Plum has been made to do duty in the development of a dozen or more varieties of cultivated Plums. Its range is from the Atlantic coast west to the Rocky Mountains and south to the Gulf of Mexico. It blossoms in April and May and bears fruit from August to October, preferring to grow in narrow, open woods and along the borders of streams.

The Plums are distinguished from the Peaches through their smooth coats and their unwrinkled seed. It is a curious fact that the varieties derived from the Wild Yellow or Red Plum and its related American species, and also the Japanese Plum, are practically sterile to their own pollen, and do not produce profusely enough for profitable cultivation unless within reach of other varieties for cross fertilization.

Purpleleaf Plum, *Prunus cerasifera pissardi.* The leaves are purple, and while not as deep in color as some purple leaf plants, it is more lasting. The round, red fruits seem self sterile. The flowers are rather small and not attractive. This sort was introduced into France by Pissard, gardener to the Shah of Persia. It is susceptible to San Jose scale. It should be pruned heavily in the Spring to get vigorous, highly colored foliage.

Variety *spathiana* has shining leaves which are said to retain their color better than *pissardi.*

Beach Plum, *Prunus maritima.* Native from New Brunswick to Virginia. This is a decorative species, being a shrub only 8 ft. high at the seaside, but more treelike away from the coast. The three, flowered clusters of bloom appear in May. The leaves, 1 to 2 in. long, are dull green above. The underside of the leaves and the young growth are slightly hairy. The purple fruits ripen in August or September, and are good for jelly. It thrives best in the hot sands along the seacoast, and tolerates the salt spray.

THE PEACH

Peach, *Prunus amygdalus persica.* These are lovely trees with showy bloom of white, rose, and bright red, blossoming in May. The most desirable varieties are the double flowered sorts and the Purpleleaf Peach.

Scale on the Japanese Cherries

Dr. B. O. Dodge, in *Horticulture,* writes: The worst enemy of the Japanese Cherry is a scale insect, commonly referred to as the white Peach scale or the West Indian Peach scale. In Bermuda, where it is a very destructive pest of the Oleander, there are ten broods a year. Since each female lays about 150 eggs, it is readily seen what an enormous progeny may develop from a single insect in a year's time. Fortunately, in the vicinity of New York only two

broods a year are hatched out, one in early June and the other in August. The usual method of controlling such scale insects consists in spraying the trees in the Spring when they are still dormant with a solution of lime sulphur in the proportion 1.9. This is about 90 per cent effective against the Cherry scale. The 10 per cent remaining is fully capable, however, of raising a fairly large family during the Summer. It has been found that certain oil sprays are more efficient but are likely, in the hands of a novice at least, to produce spray injury.

The Summer broods can be destroyed if they are sprayed with a solution of nicotine sulphate, one pint to 100 gallons of water to which has been added about six pounds of fish-oil soap. This spray mixture should be applied at the time when the young insects are crawling along the branches and before they have settled down. Once they become located, they spin out and secrete a protective covering.

Propagation

Seeds. Most of the true species may readily be grown from seed. The Boyce Thompson Institute gives the following figures relative to germination:

	Best temperature	*Days to germinate*
Prunus americana	41	150
Prunus simoni (Apricot), stones not cracked	50	45
Prunus simoni (Apricot), stones cracked	41	25
Peach, stones not cracked	41-50	60-100
Peach, stones cracked	41	35-60
Damson Plum, stones not cracked	41	110
Damson Plum, stones cracked	41	84
Prunus avium (Mazzard)	41	90
Prunus cerasus (Montmorency)	41	120
Prunus avium (Early Richmond), stones not cracked	32	90
Prunus avium (Early Richmond), stones cracked	32	60

From this it may be easily seen that it is wise to crack the stones or pits as an aid to rapid germination. It is advisable to submit the seeds to a definite temperature for a definite period of days to induce germination.

Prof. L. C. Chadwick has been good enough to supply the following notes on propagation:

The use of Japanese Flowering Cherries in this country has been limited largely because of the inability of finding suitable stocks on which to graft. Flowering Cherries, budded or grafted onto stocks used for other members of the genus Prunus grown in this country.

have failed to give satisfactory stands. Many of the desirable varieties are double and fail to set seed, while cuttings, as a rule, have not proven successful. *P. serrulata lannesiana* has been successfully rooted from cuttings, but it does not produce suitable stock. Some attention has been given to the use of *Prunus tomentosa* as a suitable stock, but these tests have not been sufficient to warrant recommendations.

Even with these limitations, budding and grafting have been used largely. Budding has been the most common method practiced. *Prunus serrulata* and *P. mazzard* have been used the most extensively for stocks. Budding is done on two year seedlings in July and August, the practice followed being the same as with other Prunus plants. *P. serrulata sachalinensis* was recommended by the late E. H. Wilson, but sufficient stock has not been produced. *P. subhirtella* may be used for stock for its own varieties.

Grafting should be carried out under glass in the usual manner in January and February. The side graft is to be preferred. *P. mazzard* being used for stock.

Personally, I believe that entirely too much emphasis has been placed on the choice of suitable stock. While tests have not been extensive enough to warrant such a statement as yet, I believe that most of the Flowering Cherries, if grafted on Mazzard or *P. serrulata* stock and planted deep in the lining-out rows, will develop roots from the cions in the majority of cases, and be on their own roots within a few years.

Again quoting from Paul Russell (U. S. D. A. Circular 31).

Budding and bench grafting are both satisfactory methods of propagating the double-flowering Cherries. Varieties derived from *Prunus serrulata* and also the Naden (*P. sieboldi*) may be worked on seedlings of the single-flowered forms of the former species, or on Mazzard. Preliminary trials with Mahaleb as a stock have shown it to be entirely unsatisfactory. Wilson strongly recommends seedlings of *P. serrulata sachalinensis*, the Yamasakura of Northern Japan, as a stock for *P. serrulata* varieties. This is a vigorous, tall-growing tree, the hardiest of all the Japanese Cherries, and preliminary tests indicate it as somewhat hardier than Mazzard. In Japan the common practice is to graft in early Spring on Mazakura (*P. serrulata* var. *lannesiana*), a comparatively short-lived form from the warmer parts of Japan which is popular with Japanese nurserymen because, in that country at least, it roots readily from cuttings. In hardiness this stock is comparable to Mazzard.

Varieties of *Prunus subhirtella* should be budded or grafted on their own seedlings for most satisfactory results, although a small percentage of *P. subhirtella pendula* seedlings show a more or less pendulous habit.

The Yoshino Cherry (*Prunus yedoensis*) may be propagated by seeds, although unseasonable weather and lack of proper fertilization are probably to be blamed for the failure of many trees to set fruit.

Other Cherry stocks, except those already mentioned, have not yet been tried by this department.

Propagation by cuttings has not as yet proved very successful. Hardwood and softwood cuttings of ornamental varieties in experimental plantings gave only an occasional rooted plant, and none of the double-flowering varieties formed roots. Hardwood cuttings of *Prunus serrulata* var. *lannesiana*, which is used as understock, taken in February and planted in sand in outside frames, gave a successful rooting of about 30 per cent, while cuttings taken at the same time and put in sand in a cool greenhouse with bottom heat gave a rooting of 90 per cent.

PTELEA—Hoptree

(Teel′-e-a. Name derived from *Ptelea*, the Greek name for Elm. It also has winged seeds like Elm.)

Hoptree (Shrubby Trefoil) (Wafer-ash), *Ptelea trifoliata*. Native from New York to Florida, and successful in regions 1, 2, 4, 6, 7, 8, 12, 14, 18-30. It becomes a small tree, 20 ft. tall, with small greenish blossoms in May and June. It is three-leaved, which are dotted when held to the light. They have a hoplike odor. The buds are super-

The Epaulette-tree, Pterostyrax, produces unique clusters of pendulous white flowers

posed, small, and pubescent. The fruits are Elmlike but larger, and remain on the bush all Summer. It prefers shady, moist locations.

PROPAGATION

Seeds. Sow in Autumn or stratify in sand.
Layers. Hoptree roots readily from layers.
Grafting. The golden form is grafted or budded on the type.

PTEROSTYRAX—Epaulette-tree

(Ter-o-sty′-rax. Name derived from *pteron,* meaning wing, and *styrax,* meaning winged fruit of one species.)

Epaulette-tree (Wistaria-tree), *Pterostyrax hispida.* Native in China and Japan. The slender branches of this tree, which reaches 45 ft., form an open head. There are large, creamy-white, pendulous panicles of fragrant blossoms terminating the short, lateral branchlets. The leaves are oblong to ovate-oblong, 3 to 7 in. long, pointed, rounded at the base, with minute teeth. The branchlets are sparingly hairy. The trees bear winged, dry drupes. It prefers moderately moist sand. The young trees suffer some winterkilling, making pruning necessary. It may be necessary to train them treelike at first, cutting out the suckers.

PROPAGATION

Seeds. They should be sown in the Autumn soon after ripening.
Greenwood cuttings should be placed under glass.

QUERCUS—Oak

(Kwer′-kus. From *quer,* fine, and *cuez,* Celtic for a tree; others say from Greek *choiros,* a pig, because pigs feed on the acorns.)

Oaks are the most noble of our forest trees. They are the symbol of grandeur, strength and durability, and are quite free from pests. They are among the most useful of trees. Oaks naturally produce deep tap roots but also many side roots. The trees are generally broader than high. Oaks have been considered sacred to the Hebrews, Greeks, Romans, and most ancient people. We think of the wood as being the greatest value of the Oaks, but Loudon observes that it was the acorn which served as food for both man and beast and formed a chief wealth of nations.

The Cork Oak. The writer is indebted to an interesting article by Nelson Courtland Brown in *The Nature Magazine* for some interesting facts about the Cork Oak:

Under the warm, bright skies of Spain and Portugal, in southern France, Italy, Sardinia, Algiers, Tunis and the north coast of Africa, there grow forests like old, gnarled, bushy-crowned Apple trees. Every seven or eight years a swarthy native flashes a sharp knife lengthwise up one of these trees for about five feet. The knife girdles the tree above and below this cut. Deftly a prying tool slips in and the Cork Oak has yielded its bark to stopple our bottles, to line our ice chests, and to serve us in many ways.

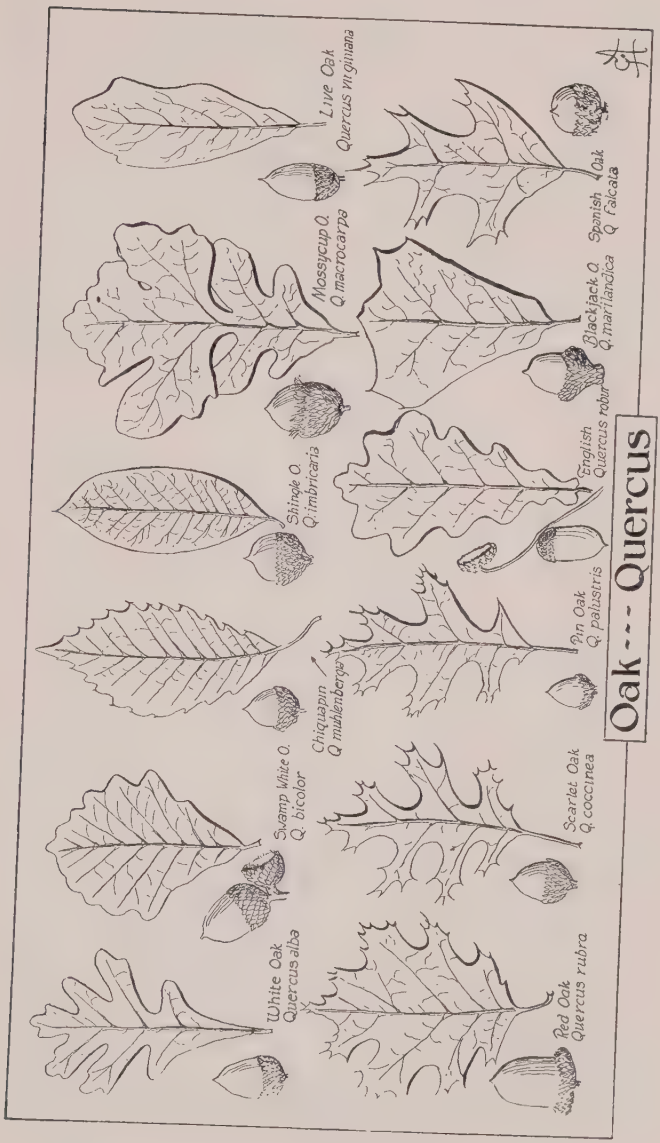
The fishermen of ancient Greece and Rome buoyed up their nets with cork. The Spanish government forbids taking the bark from trees less than five inches in diameter. Seven or eight years after having lost its bark a new coating can be harvested, and the forests are managed according to rotation of crop.

After the harvesting of the bark, the bare tree trunks become deep red in color. The bark removed is often 2½ inches thick. Once dried, the strips of bark are taken to the manufacturing centers, where each piece is flattened out by a steaming or hot water process and the rougher bark is scraped. Light, elastic, compressible. resisting air and liquids, relectantly conducting heat and cold, it is made into floors, and pincushions, bath mats and washers, carburetor floats and fishing rod handles, mattress stuffing and penholders, furniture and insulators, life belts and inner soles.

Classification. The Oaks may be divided into two groups. One group is the White Oak group, which includes such Oaks as the White Oak, the Bur Oak, and the Live Oak. In this group the acorns are mature in one year. Therefore each tree has acorns which are all the same age when observed. The leaves have rounded lobes, with the exception of such Oaks as the Live Oak and the Post Oak, both of which have entire leaves. The acorns of this group are seldom bitter.

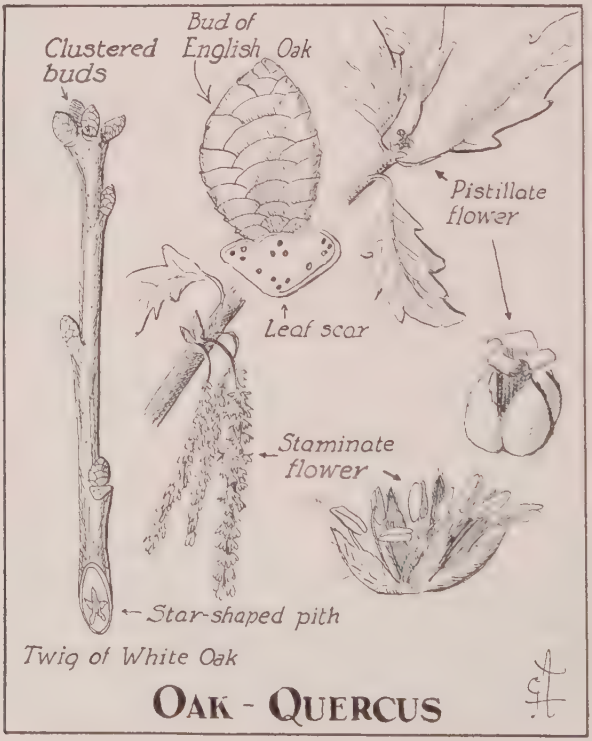
The second group is the Black Oak group. To this group belong the Black, the Red, the Pin, the Scarlet, the Willow and the Laurel Oaks. The acorns take two years to mature, therefore the trees have young and old acorns on them when observed. The lobes of the leaves are sharp-pointed and tipped with bristles. The acorns are very bitter.

Species. White Oak, *Quercus alba*. Native to Maine and Florida, W. to Minnesota and Texas, and successful in regions 1,2,9,22, 24 to 28. Rehder says that it is one of the noblest trees in the Northern States. Its stout, spreading branches and broad, open head tower 90 ft. and it has great longevity. The leaves are obovate to oblong-obovate, 4 to 9 in. long, five to nine smooth lobes, narrowed at the base, and turn wine-red or violet-purple in the Autumn. The twigs are soon smooth, becoming red-brown, often grayish. The buds are obtuse and small. The wood is used for shipbuilding, carriages, agricultural implements, baskets, interior finish, cabinet-making and railroad ties. The White


Live Oak
Quercus virginiana
Mossycup O.
Q. macrocarpa
Shingle O.
Q. imbricaria
Swamp White O.
Q. bicolor
White Oak
Quercus alba
Spanish Oak
Q. Falcata
Blackjack O.
Q. marilandica
English
Quercus robur
Pin Oak
Q. palustris
Chiquapin
Q. muhlenbergii
Scarlet Oak
Q. coccinea
Red Oak
Quercus rubra
Oak --- Quercus

Oak prefers sandy plains and reaches best development in rich, moist soil. Newly transplanted trees should be pruned severely. As a street tree, it has a slow growth and litters the streets by leaves falling during Fall and Winter. This is not an objection for the forest, of course.

Scarlet Oak, *Quercus coccinea*. Native from Maine to Florida, west to Minnesota and Missouri, and successful in regions 7, 24, 25, 27 and 28. It has a round-topped, open head, attaining a height of 75 ft., and the trunk generally continues into the top of the tree. The leaves are oblong or elliptical, 3 to 6 in. long, straight across or broad wedge-shaped, wavy margined, cleft in a feather-formed way, seven to nine lobes with slightly curled sharp, coarse, spreading teeth, and round based spaces between the lobes. The bark is gray, inner reddish, and the twigs are orange-red. The acorn has a top-shaped cup inclosing one-third to one-half of the nut. There are tight scales



on the cup. The tree is of little timber value. It prefers dry, sandy soil, although it is less particular than the Red Oak. COMPARISONS. The buds are woolly at the upper part. Resembles the Red Oak, but with deeper-lobed leaves and deeper-cup acorns.

Bear or Black Scrub Oak, *Quercus ilicifolia*. Grows 8 to 20 ft., has spreading, tangled branches, three- to seven-lobed leaves, with the lobes ending in bristles, the lower side with whitish hairs. Good for planting on barren hillsides. The acorns do not retain their vitality for a long time, so it is well to sow them as soon as they are ripe.

Mossycup Oak (Bur Oak), *Quercus macrocarpa*. It is easy to identify this, as it is true that the cups are mossy. Native from Nova Scotia to Pennsylvania, west to Manitoba and south to Florida, and successful in regions 4, 9, 15, 18 to 29. It is one of the hardiest Oaks and is rarely taller than 75 ft. The leaves are obovate to oblong-obovate, 4 to 9½ in. long, wedge-shaped or rarely rounded at the base, feather-formed but with large terminal lobe and others smaller. They are grayish or whitish beneath. The bark is light brown, deeply furrowed and scaly. The twigs are stout, generally developing corky wings. The buds are usually closely pressed to the twig. There is a fringe of woolly growth from the scales of the fruit. The Mossycup Oak is quite free from pests and tolerates smoke. It prefers low, rich bottomlands. Does not thrive in uplands like the White Oak, and is intolerant of shade. The wood is used for fences.

Blackjack Oak (Barren Oak), *Quercus marilandica* (*ferruginea*). Native from New York to Florida, and west to Nebraska and Texas. This tree, 30 ft. tall and rarely 50 ft., has stout, spreading branches and a narrow, irregular head. The leaves are broad, obovate, 4 to 8 in. long, and often nearly as broad at apex, rounded base. They are three- to five-lobed at the apex, with broad and almost smooth lobes. The bark is thick and roughened by deep fissures. The twigs are stout at first, pale woolly later, and smooth and dark-brown. The buds are sharp-pointed and angular. A hemispherical cup covers half of the nut. The Blackjack Oak thrives in poor, dry, sterile and sandy soil. It has a scrubby, unkempt appearance and seems to appear to need pruning. It is very slow growing and Henry Hicks tells us not to consider them trees until they are ten to fifteen years old. The wood is used for fuel and charcoal.

Water Oak, *Quercus nigra* (*aquatica*). Native from Delaware to Florida, west to Kentucky and Texas. This is a handsome tree, with slender branchlets and a conical round head, attaining 75 ft. The leaves are obovate, three-lobed at the apex, sometimes smooth-edged, rarely feather-formed, lobed above the middle, 1 to 3 in. long, bluish-

green above, and paler beneath. The acorn is inclosed one-third or one-quarter by a cup. It is used as an avenue tree.

Pin Oak (Swamp Oak) (Water Oak), *Quercus palustris*. Native from Massachusetts to Delaware, west to Wisconsin and Arkansas, and successful in regions 1, 2, 19, 21, 22, 24, 25, 27, 28 and 29. It is usually 75 ft. high, rarely 120 ft., with slender branches usually pendulous at the ends. The trunk extends up through the head, and the tree is symmeterically pyramidal when young. The leaves are elliptic to elliptic-oblong, 3 to 4¾ in. long, wavy-margined, feather-formed, five to seven lobes, which are backward-bent margined, sharp, spreading, coarse-toothed, lustrous and have bristle tips. The leaves turn scarlet and fall late in the year. The twigs are dark red-brown or orange. The branches are beset with short, lateral shoots, which give it the name of Pin Oak. The fruits are small and have a saucer-

The staminate or male flowers of the Oak are produced in long, drooping catkins

like cup. It is found on the river bottoms but is easy to transplant. When used for a street tree, it has to be pruned to correct the drooping habit, for it is planted more commonly than any other Oak. The wood is used for shingles and clapboarding.

Willow Oak, *Quercus phellos*. Phellos is the ancient name of the Oak. This is successful in regions 20 and 28 to 31. It grows 60 ft. high, with a conical, round-topped head. It has quick growth, especially in the Southern States. The leaves are linear-oblong to lanceolate sharp at the ends, 2 to 4 in. long, lustrous above, hairy beneath when young, half evergreen in the South, and sort of Willow-like. They turn yellow in Autumn. The twigs are slender, smooth and red-brown. The cups of the acorn are very shallow.

Chestnut Oak (Basket Oak), *Quercus prinus* (*montana*). In the South this tree becomes 100 ft. high, but is usually only 25 to 50 ft. It is often broader than it is high. The leaves are round-toothed, have wavy margins, and are wedge-shaped at the base. The bark is brown and close, not flaky. The twigs are light orange to red-brown. It is found on dry hillsides and becomes crooked unless trained. The wood is used for railroad ties and fences.

English Oak, *Quercus robur* (*pedunculata*). Native to Europe, North Africa, Western Asia, and successful in regions 2 and 7. It is 75 ft. tall, occasionally 150 ft. The leaves are obovate to obovate-oblong, 2 to 5 in. long, slightly heart-shaped or straight across the base, three to seven pairs of rounded lobes. The trunk is thick, with a deeply furrowed bark. The branchlets are glabrous. The name *robur* means strength, alluding to the quality of the wood. There are many varieties of the English Oak, some with deeply lobed leaves, others scarcely resembling the typical foliage.

Variety *fastigiata*. It has a columnar head like a Lombardy Poplar.

Red Oak, *Quercus rubra* (*borealis*). With its symmetrical top, Charles L. Pack says that it comes the nearest to being the best shade tree for the Eastern half of the United States. It is successful in regions 1, 2, 6, 7, 12, 19, 21 to 30. It has a straight trunk and attains a height of 70 to 90 ft. The leaves are obovate, 5 to 9 in. long, seven- to nine-lobed, with the spaces between the lobes reaching halfway to the midrib. Each lobe is ascending and with but a few bristle teeth. The leaves are dull green, with a red midrib, and turn red in the Autumn. The bark is thick, slowly broken into fissures and flat-top ridges. The branchlets are smooth, greenish-brown to dark-brown. The buds are widest above the middle. There are large acorns with shallow cups. thrives in porous and gravelly clay soil, which is not wet. It does not tolerate shade when it is young. It makes the most rapid growth of

all Oaks. The Red Oak is a splendid street tree, being very popular in Europe. The wood is used for furniture, cooperage and interior finish.

Live Oak, *Quercus virginiana* (*virens*). This Oak is evergreen, with horizontal bands and grows 60 ft. tall. The twigs are hairy. The leaves are elliptical to oblong, 2 to 4½ in. long, generally obtuse, with a few teeth above the middle, lustrous above, whitish beneath. the acorn is oval, about 1 in. long. It is a native from Virginia to Florida, west to Mexico. The beautiful Live Oaks of the South are noted for their picturesque appearance in the landscape. The strong, horizontal branches are generally draped with long strands of Spanish-moss. They make rapid growth as street or shade trees.

PROPAGATION

Seeds. Whereas many acorns need not be sown immediately, the White Oaks, the Chinquapin Oak and the Yellow Oak, sprout soon after falling and should therefore be sown at once for best results. The others may be placed in sand, where they will not dry out, and be sown just before frost or Winter sets in. Cover the acorns with sand to avoid baking, which interferes with the growth of the sprouts. It will be well to give a mulch of leaves after the ground freezes to prevent heaving by frost. Joseph Meehan mentions that the order of ripening is as follows: Chinquapin Oak, Chestnut Oak, followed by the White Oak.

Grafting. Oaks are seldom grafted, but such varieties as the Pyramid English Oak is grafted on the English Oak, (*Quercus robur*. They are usually grafted in the greenhouse.

RHUS—Sumac

(Roos'. Name derived from same root as *red;* others derive the name from *rheo*, Greek for *I run*, from the habit of the roots running under ground for great distances. Sumac is from *Simaq*, its Arabic name.)

Staghorn Sumac, *Rhus hirta* (*typhina*, from *typos*, meaning stupor, referring to its use to produce a stupor). The twigs are very crooked, and it grows to be only 30 ft. tall, but is often treelike. The flowers are greenish. There are eleven to thirteen leaflets, glaucous beneath. The branches are densely velvety hairy, thus its name Staghorn. The foliage turns a gorgeous red and orange. The fruits are crimson and hairy and are very sour. It is said that they were formerly used for lemonade. Staghorn Sumac is semi-wild and thrives in poor, rocky, deep soil, and in the shade. It should, however, be pruned yearly. It is very useful, being marvelously striking for natur-

alistic plantings, and appropriate for large parks, also for railroad banks and steep slopes. In such spots its suckering nature is not objectionable. The bark is used for its tannin in dressing leather. The Shredded Sumac, variety *laciniata*, has deeply cut, fernlike leaves.

Smooth Sumac, *Rhus glabra*. Native from Maine to British Columbia, south to Florida and Arizona. It is only 9 to 15 ft. tall, with greenish flowers. The branchlets are smooth and grayish. There are eleven to thirteen leaflets, lanceolate-oblong, 2 to 5 in. long, sharp-pointed, and with a beautiful color. The fruits are scarlet, sticky hairy. They have a most brilliant glowing color in August, and the effect persists for a long time.

The Cutleaf Sumac is the variety *laciniata*. The leaves are deeply cut and seem almost fernlike. The decorative grace of this variety serves to make it more desirable for cultivation than the typical, wild form.

Java Sumac, *Rhus javanica* (*osbecki*) (*semialata*). Native of Japan, China and Southern Asia. It tolerates 25 degrees below zero. It is only 25 ft. high, with white clusters or heads of flowers which are more showy than the other sorts. There are seven to thirteen leaflets, winged between, 15 in. long, brownish-pubescent beneath. They turn orange and yellow in the Fall. The branchlets are yellowish and glabrous. The fruits are red-orange and are densely hairy. It prefers good soil and is used much as a specimen, and is valuable too because of the flower clusters in the Fall. It can be cut to the soil each year, with larger leaves resulting, but it does not sucker.

Smoketree (Venetian Sumac, Wigtree, Purple Fringetree), *Rhus cotinus* (*coggygria*). Native from Southern Europe to Southern China. It differs from *Rhus americanus* (*cotinoides*) by its smaller leaves, which are contracted at the base abruptly, and being more showy because of plumes. It is only 15 ft. high, with green or purplish blooms (really flower stems) which are densely featherlike and produce a mistiness which gives the name of Smoketree to this sort. The leaves are oval, glabrous, somewhat glaucous, and odoriferous. They turn red or orange. It needs to be pruned in the Spring to keep it in good shape. It is used as a specimen and also for tanning and dyeing wood and leather. The Smoketrees are rather shrubby and their misty grace serves as a splendid background for seats and perennial borders.

Lacquer is derived from the species *R. vernicifera*, the Lacquer-tree, a native of Japan and Nepal. The leaves are larger than most Sumacs and more like those of some Walnuts. Varnish oozes from cuts made in the bark. When first collected it is whitish and as thick as cream. Upon exposure to the air it becomes darker and thicker. It is trans-

parent, and when applied to wood brings out the grain. Lacquer is generally applied over a dark coat, in which case it acts as a mirror. True lacquer does not tolerate blows but chips very easily, yet it can stand boiling water without injury.

PROPAGATION

Seeds. Sow the seeds in the Autumn and stratify.

Cuttings. Hardwood cuttings are successful.

Root cuttings. Sumacs are noted for their suckering ability, so that the roots may be cut into 3 in. lengths, buried in the sand until Spring, and then set out in rows.

Layers. Most sorts can be layered easily, especially the Smoketree.

ROBINIA—Locust

(Ro-bin'-i-a. Named after Jean and Vespanian Robin, French botanists, herbalists to Henry IV.)

Note the curious leaf scars through which the buds burst

Common Locust (Black Locust) (False-acacia) (Yellow Locust), *Robinia pseudoacacia.* When first introduced this was considered to be an Acacia. It was named Locust by missionaries who fancied that this was the plant which furnished food to St. John the Baptist in the wilderness, but it is a native of North America from Pennsylvania to Georgia, west to Iowa, Missouri, and Oklahoma, and successful in regions 1, 2, 4, 6, 7, 8, 9, 11, 13, 14, 18 and 19. It becomes 75 ft. tall and bears very fragrant, dense racemes, 4 to 8 in. long, with white standards and yellow spots at the base. The leaves are odd feather-formed, seven to nineteen, elliptical, sharp-pointed, and fold at night. The bark is deeply furrowed and brown. The Winter buds are naked, and are hidden by the base of the petiole before the leaf falls. The branchlets have stipular spines. The twigs are often zigzag and brittle. The roots have the sweet flavor of licorice. The Common Locust does well on dry, sandy soil. Being a legume, it is said to improve the soil, but the bacteria feed the tree and not the soil unless the roots be left in it. It is almost impossible to drive a nail through it without splitting, although it is used for shipbuilding and posts. The brittle wood branches often break in storms. Also, it

suckers when used as a lawn tree. It is susceptible to borers and Locust leaf miner; otherwise it would be more popular.

Variety *inermis* lacks the prickles and is, therefore, more desired for cultivation.

Rose-acacia (Moss Locust), *Robinia hispida.* Native from Virginia to Eastern Tennessee, Georgia and Alabama. It is very irregular, sometimes being 1 to 3 ft. high, and then sometimes 16 ft. high. It bears a rosy-pink, pealike bloom, in three to five flowered racemes, which appear in June. There are seven to thirteen soft green leaflets. The branches are covered with bristles, and the wood is very brittle. The pod is densely hairy, purple in the late Summer. It thrives in any soil, but needs frequent pruning in the Spring to keep in shape. There are two forms; one is quite upright, while another sprawls and does not seed. They sucker freely, and to make them less spreading, this species is frequently grafted upon the Common Locust.

Kelsey Locust (Carolina Mountain-rose), *Robinia kelseyi.* This is 4 to 8 ft. tall, and thrives in dry or moist soil. There are five to eight rose-colored racemes of blossoms. The seed pods are showy, with purple glandular hairs. There are nine to eleven leaflets, glabrous, sharp. The twigs are prickly. It has a loose, straggly growth and needs to be pruned often to make better form.

Clammy Locust, *Robinia viscosa.* Native from North Carolina to Alabama. It is 36 ft. tall, bearing pink flowers with yellow-blotched standards. There are thirteen to twenty-five leaflets. The twigs are dark red-brown, and both the twigs and seed pods are glandular sticky. It suckers freely.

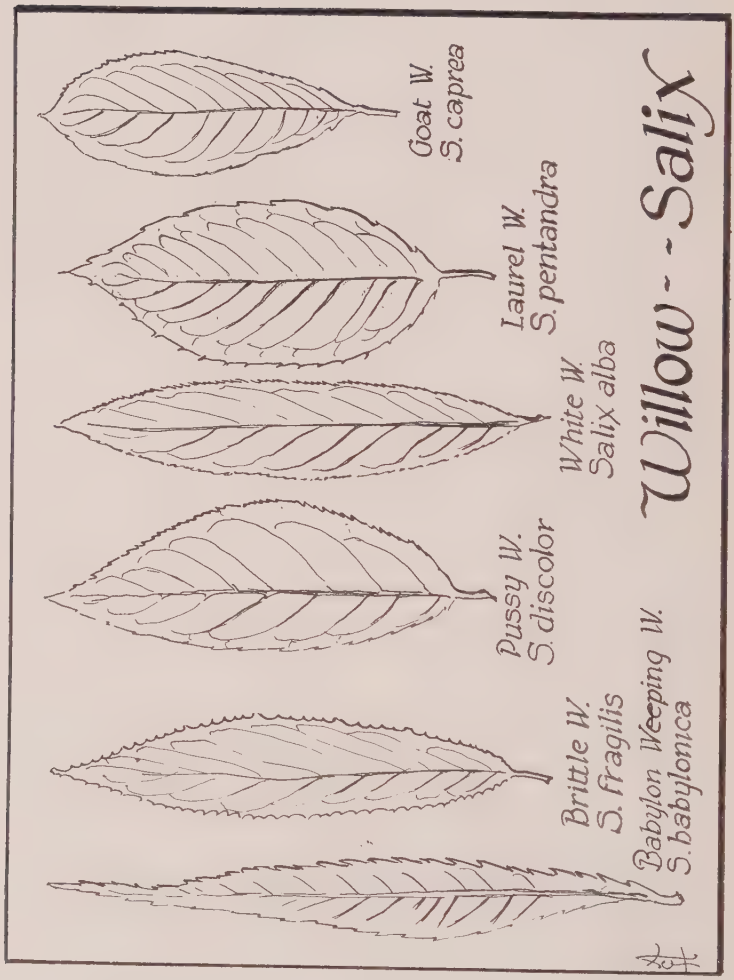
Propagation

Seeds. The seeds of the Locust are notably hard, and should be scalded with hot water before sowing. If the seeds are sown soon after ripening, they do not have an opportunity to become so hard and bony. It may be well to store them in moist soil throughout the Winter.

Root cuttings. Some species sucker freely, so that they are propagated by root cuttings.

Grafting. The Rose-acacia is generally grafted upon the Common Locust to make it treelike and to prevent suckering.

> "*It costs just as much to move a poor tree as a good one—why waste time and money on anything but the best?*"—Charles Irish.


Goat W.
S. caprea
Laurel W.
S. pentandra
White W.
Salix alba
Pussy W.
S. discolor
Brittle W.
S. fragilis
Babylon Weeping W.
S. babylonica
Willow - - Salix

SALIX—Willow

(From Celtic *sal,* near, and *lis, water;* in reference to their general habit.)

The graceful trees known as Willows are usually associated in our minds with the waterside, although some are alpine shrubs, but it may be said that they like a cold, moist soil. "Ropes and baskets made from Willow twigs were probably among the very first of human manufactures," writes J. C. Loudon. The Romans used the twigs for binding their vines. A crop of Willows was so valuable in the time of Cato that he ranks the Willow field next in value to the vineyard and the garden.

KEY TO WILLOWS

(Adapted from Rehder)

1. Upright, not weeping.....2
1. Weeping Willows.....7
2. Leaves green on both sides, petioles glandular.....*S. pentandra*
2. Leaves gray beneath.....3
3. Leaves white, woolly beneath.....*S. incana*
3. Leaves merely slightly hairy beneath.....4
3. Leaves smooth, not hairy beneath.....6
4. Leaves four times longer than broad.....*S. alba*
4. Leaves less than four times longer than broad.....5
5. Twigs yellow.....*S. discolor*
5. Twigs brownish.....*S. caprea*
6. Petiole glandular, branchlets very brittle (snapping off when barely touched).....*S. fragilis*
6. Petiole without glands, branchlets not so brittle.....*S. discolor*
7. Branchlets olive to red brown.....8
7. Branchlets yellow, leaves silky beneath.....*S. alba tristis*
8. Leaves narrow lanceolate, ⅜ to ⅝ in. wide.....9
8. Leaves lanceolate, broader, ½ to ⅞ in. wide.....10
8. Leaves broad, elliptical.....*S. caprea pendula*
9. Leaves smooth beneath.....*S. babylonica*
9. Leaves silky beneath.....*S. salamoni*
10. Veins at angle of more than 45 deg.....*S. elegantissima*
10. Veins at angle of less than 45 deg.....*S. blanda*

Species

White Willow, *Salix alba.* Native of Europe from Norway to Mediterranean region. The branches are spreading, pendulous at the ends, and the tree attains a height of 75 ft. The branchlets are silky when young, olive-brown, and spreading at an angle of 30 to 45 deg. The leaves are lanceolate, 2 to 4 in. long, pointed, and silky beneath.

Variety *vitellina*. The branches are yellow. The leaves are narrow-lanceolate, long-pointed, gray beneath, and slightly silky. The twigs from this tree are used for baskets and for tying. It is striking when placed among evergreens.

Variety Bronze Golden Willow, *S. alba chermesina* (*britzensis*) The branchlets are bright red.

Babylon Weeping Willow, *Salix babylonica*. The Babylon Weeping Willow is native to China. It is 30 ft. tall, with pendulous branches that sweep the soil. The branchlets are brown and are smooth when mature. The leaves are lanceolate to linear-lanceolate, 3 to 6 in. long, long-pointed, grayish beneath, and are distinctly veined. This is the Willow which was planted near Napoleon's tomb in St. Helena.

Wisconsin Weeping Willow, *Salix* (*blanda*) (*babylonica* × *fragilis*) (*dolorosa*). It has a wide head with pendulous branches. The branchlets are dull green and brown, and are brittle at the base. The leaves are lanceolate to narrow-lanceolate, 3 to 6 in. long, and are long-pointed.

Goat Willow (Sallow), *Salix caprea*. Name derived from the reputed fondness of goats for catkins. It is found native from Europe to Northeastern Asia. It grows to be 27 ft. high, and is considered a shrub or a tree. The branchlets are brown or purplish, and the twigs are brown, pubescent when young. The pussies are showy; it is one of the best. The leaves are variable, egg-shaped to oval, rounded, somewhat heart-shaped at the base, felty beneath, and are broader than those of most Willows. The sprays may be forced in water, causing the season of the Pussies to be two to three months, from Winter to Spring.

Variety *pendula*, Killmarnock Willow. It has stiffly pendulous branchlets.

Pussy Willow, *Salix discolor*. Native from Nova Scotia to Manitoba, south to Virginia and Missouri. It is a shrub or small tree, growing only 12 ft. tall. The twigs are pubescent at first, and yellow. The buds are blackish. The leaves are elliptical-oblong to oblong-oblanceolate, 2 to 4 in. long, irregular toothed or nearly entire.

Brittle Willow (Crack Willow), *Salix fragilis*. It was found in Europe and Western Asia, but escaped. Has a bushy head and grows to be 90 ft. tall. The twigs are brittle at the base so that the slightest blow breaks them from the branches. They are a glabrous, lustrous olive. The leaves are oblong-lanceolate to narrow-lanceolate. This is not one of the most beautiful of the Willows but it is very commonly seen.

Willows mirror their fleecy gray foliage in this quiet lake

Rosemary Willow, *Salix incana* (*rosmarinifolia*). This is either a shrub or a tree, 45 ft. tall, and native of Europe. The twigs are gray and pubescent. The leaves are 2 to 5 in. long, linear, white woolly beneath. The margins are finely saw-toothed and roll backward.

Laurel Willow (Bayleaf Willow), *Salix pentandra* (*laurifolia*). Native from Europe to Caucasus, escaped in Eastern States. It is a large shrub or tree 60 ft. tall, with gray bark. The twigs are lustrous, brownish-green, and the young growth is sticky. The buds are yellow. It has golden yellow catkins, which are fragrant. The leaves are egg-shaped to egg-shaped-oblong, 3 to 5 in. long, shining above, short-pointed, rounded or a trifle heart-shaped at the base. This tree can be grown at seashore communities, as the foliage is never injured by high winds. However, the tree often has certain caterpillars. It is grown for its lustrous leaves.

Salamon Weeping Willow, *Salix salamoni* (*sepulcralis*) (*blanda* × *alba*). The branches of this variety are similar to those of *Salix babylonica*, being pendulous, but the former is more vigorous. It is less weeping and the young growth is silky, with stouter branchlets. The leaves are larger than those of *S. babylonica*, and are bluish or whitish beneath, and are also silky pubescent beneath. This variety should be transplanted when perfectly dormant.

PROPAGATION

Cuttings. They root very readily so that seeds are not used, hardwood cuttings being merely inserted in the soil in the Spring. The Kilmarnock Pussy Willow is grafted on the Goat Willow, from which it is derived, to give stronger shoots.

SASSAFRAS—Mittenleaf

(Sas-sa-fras′. A corruption of the Spanish word *Salsafras*, or *Saxifras*, a species of Saxifraga, which is supposed to have the same virtues.)

Sassafras (Saxifras) *Sassafras variifolium* (*officinale*). Native from Massachusetts to South Carolina and Kentucky. It attains a height of 60 ft., with rather twisted branches, which are so brittle that they are easily broken by storms. The flowers are yellow, with staminate and pistillate flowers on different plants. The leaves are usually one- to three-lobed, and turn orange-scarlet in the Autumn. The bark is a dark cinnamon-gray, and is deeply furrowed. The twigs are hairy when young, and yellowish-green, aromatic, and with very unequal internodes. The scanty fruits are bluish-black, with red stems, and surrounded at the base by thick, scarlet calyx. The birds eat the berries. The tree prefers sandy loam and tolerates shade and water.

Three mammoth Sassafras trees. Such large specimens are rare

a, The variation of the leaves; b, the twig showing the prominent terminal bud and the smaller side buds; c, the oval bud showing also the almost continuous line of the bundle scar

The living wood is not destroyed by borers. It was thought that a decoction of bark would cure the ague. The wood is used for fence posts or yokes, and the roots are used for an aromatic stimulant and to flavor candy and scent soap. The tree sprouts constantly. It is very difficult to transplant from the wild, as what seem to be small trees are really suckers and are not individually well rooted. Cut the suckers some time ahead of transplanting.

PROPAGATION

Seeds. They ripen in the Fall and should be sown immediately or kept in moist earth and sown in the Spring.

Root cuttings. Whenever the roots are injured, suckers start, so that root cuttings are successful.

SCHINUS—Peppertree

(Sky'-nus. From the Greek for the Mastictree which this group resembles.)

Peppertree, *Schinus molle*. Native of Peru, where it is called Mulli. It is successful in region 5. It is a semi-pendulous tree, growing 20 ft. tall, with olive-green foliage consisting of numerous leaflets. The fruits are rose-colored and produced in large pendulous clusters. McLaren recommends planting it in the vicinity of chicken yards but it does well in any soil.

The fruit of the Peppertree is light red and produced in large clusters

An avenue of young Peppertrees in California

PROPAGATION

Seeds. They grow readily.
Cuttings. They are used in California.

SOPHORA—Scholartree (Pagoda-tree)

(Sof-or'-a. Arabic name of some tree which bore pea-like flowers.)

Chinese Scholartree (Japan Pagoda-tree), *Sophora japonica*. Native of China and Korea. The old trees in China look like Oaks. It is called the Pagoda tree because it grows around pagodas of temples. It attains a height of 75 ft. and is round-headed. The flowers are borne in terminal, loose panicles, 12 in. long, and are creamy-white, pealike. The leaves are odd feather-formed, seven to seventeen opposite leaflets, ovate, 1 to 2 in. long, sharp at the tips, rounded at

The Chinese Scholartree, Sophora, has been cultivated for a thousand years

the base, dark green and lustrous above, with gray appressed hairs beneath. The twigs are dark green, even on branches of some age. The pods are constricted between seeds, and rarely open. They are soapy to touch when crushed. The tree thrives in high or low places, but needs plenty of water in California. It thrives in the city so is used as an avenue tree. It is also a good lawn tree, holding its leaves late, and is seldom susceptible to insect pests. However, it is tardy in coming into bloom, sometimes twenty-five to thirty years, and is of slow growth, so that the nurseryman waits too long for salable trees. It has been cultivated in Japan for more than 1000 years and is hardy as far North as New York, Indiana and southern Iowa.

var. *pendula*. This is a weeping variety, and is commonly grafted on the type.

PROPAGATION

Seeds. They grow readily, especially when they are freshly gathered, but when sown in Spring, the seeds need soaking in hot water.

Cuttings. Softwood cuttings can be taken from plants forced in the greenhouse.

Grafting. The Weeping Scholartree is grafted on the type.

SORBUS—Mountain-ash

(Sor′-bus. Ancient Latin name.)

American Mountain-ash (Dogberry) (Fowlers-service) (Indian Mozemize) (Quickbeam), *Sorbus americana* (*Pyrus americana*). Native from Newfoundland to Manitoba, south to North Carolina and Michigan. It has a round-topped head, attaining a height of 30 ft. The flowers are borne in terminal corymbs, white, and glabrous. The leaves are compound, eleven to seventeen leaflets, lanceolate-oblong to lanceolate-tapering, $1\frac{3}{4}$ to $3\frac{3}{4}$ in. long, sharply saw-toothed, slightly hairy beneath when young. The terminal buds are large, with curved point, purplish, not woolly. The fruits are pearlike, globular and showy. It is found on moist, rocky hillsides, and thrives even in partial shade, but prefers cool situations and good loam. It should be pruned sparingly. The branches are easily broken by winds. The tree is short-lived and subject to scale and borers. Its beauty comes in the flowers and the fruits.

European Mountain-ash (Rowantree) (Fowlers-servicetree), *Sorbus aucuparia*. The name is from the Latin *aucupur*, meaning to get by cunning, used as bait for catching birds; hence also some of its common names. Native from Europe to Western Asia and Siberia. It is more shapely than *Sorbus americana*, and grows to be 45 ft. The nine

The large clusters of red Apple-like fruits of the Mountain-ash are especially relished by the Cedar Waxwings

to fifteen leaflets are oblong, sharp to obtuse, 7/8 to 2 in. long, becoming smooth gray but hairy when young. The young twigs are hairy and when older are grayish-brown. The fruits are bright orange. It thrives in any soil. It is a characteristic tree in cemeteries of Wales. In Europe it is a witch-dispelling tree. This is the Rowantree of which the British sing.

Asiatic Mountain Ashes. From a bulletin of the Arnold Arboretum we read:

In recent years a number of these trees have been brought from Eastern Asia to the Arboretum and some of them promise to be valuable trees here. The Japanese *Sorbus commixta* was the first of them which was planted here, and it has now been growing in the Arboretum since 1888. It has smaller flower clusters than the European species; the bright red fruit is smaller and its chief value is in the bright orange and red color of the leaves in Autumn.

A much handsomer plant is *Sorbus pekinensis*, a native of Northern China, which is now well established in the Arboretum. It is a slender tree with narrow leaflets, compact clusters of flowers and lustrous pink or yellowish fruit in drooping clusters. The color of the fruit is unusual among Mountainashes. The narrow leaflets give this tree a particularly open and attractive appearance. The largest and handsomest specimen in the Arboretum is in the nursery plantation near the top of Peter's Hill.

Sorbus koehneana has recently flowered and fruited in the Arboretum for the first time. It is a shrub now about three ft. high, with slender, erect stems, small leaves with numerous narrow leaflets, small compact clusters of flowers and snow white fruit. It is a beautiful shrub which when better known will become common in gardens. The plants in the Arboretum were raised from seeds collected by William Purdom in Northern Shensi.

Sorbus pohuashanensis, so named because it was discovered on the Pohua Mountains in Northern China, is also well established in the Arboretum. The leaflets are rather broader than those of the Rowantree, but it has the red fruit and woolly buds of that species and is not superior to it for general cultivation.

Although they are not as large and shapely trees as some of the Old World species, the two Mountainashes of Eastern North America, *Sorbus americana* and its variety *decora*, have no rivals in this group in the beauty of the great drooping clusters of orange fruit and in the orange and red tints of their autumn foliage. They are small trees or large shrubs and are often planted in gardens in Canada, northern Michigan and Minnesota, but unfortunately are still little known in Eastern Massachusetts.

PROPAGATION

Seeds. Wash the pulp from the seeds and stratify. The Boyce Thompson Institute advises that the seed of *Sorbus aucuparia* requires ninety days to germinate when exposed to a temperature of 32 deg. for that period.

Layers. Suckers.

STERCULIA (Firmiana) (Brachychiton)—Bottletree

(Ster-keu'-li-a. A Greek word, referring to the short, overlapping hairs and scales.)

Victorian Bottletree (Flametree), *Sterculia acerifolia.* Native of New South Wales. It is an ornamental tree of sturdy habit, thrives in dry or fairly moist places, and attains a height of 60 ft. It is not the petals but the brilliant scarlet calyxes which are the chief attraction. The leaves are 8 to 10 in. across, five- to seven-lobed. The fruits are 4 in. long and are black. Used as a street tree in California and in the Southern States.

Chinese Parasoltree (Phoenixtree) (Japanese Varnishtree), *Sterculia platanifolia* (*Firmiana simplex*). This is a smooth-barked, round-headed tree, 50 ft. tall, with heart-shaped but palmately, three- to five-lobed leaves, often one or more feet in diameter. The flowers are small and greenish. Native of China and Japan. It grows as far north as Philadelphia. The leaves are like those of the Planetree. The fruits are 5 in. long. The tree is used as a street tree, and is common in Georgia.

Black Kurrajong, *Sterculia diversifolia* (*populneum*). It is a tall tree, 60 ft. high. The leaves are oval, sometimes three- to five-lobed, 3 in. long. The flowers are a yellowish-white, reddish inside. It is used in the warmer sections of Florida.

PROPAGATION

Seeds. Sow the seeds in the Spring after danger of frost. Cover ⅛ in. deep.

Layers. Branches may be buried at any time of the year.

Cuttings. Well ripened cuttings should be placed in coldframes in September and shaded until rooted.

STEWARTIA (Stuartia) (Malachodendron)

(Stew-art'-i-a. Named in honor of John Stewart, marquis of Bute, promoter of botany.)

Mountain Stewartia (Allegheny Stewartia), *Stewartia pentagyna.* Native from North Carolina to Tennessee and Florida. It grows to

15 feet high, and must be protected in Massachusetts. The attractive flowers bloom in early Summer, are cup-shaped, 3 in. across, often six petals, white or creamy, with many purple stamens with yellow anthers. The leaves are alternate, ovate, 2 to 5 in. long, unbranched, somewhat saw-toothed, soft downy beneath, and change orange and scarlet. The twigs are smooth and the branches are cinnamon-brown. It prefers a deep, rich peat and loam, moderately moist. The trees are inclined to be bushy unless trained to a single stem. Variety *grandiflora*. It has more attractive flowers. These are lovely small trees, little known but with beautiful flowers.

Japanese Stewartia (False-camellia), *Stewartia pseudocamellia* (*japonica*) (*grandiflora*). A large shrub or small tree, growing 50 ft. tall, with cup-shaped flowers, somewhat resembling a Camellia. Flowers in July. It is a rare flower, 2½ in. across, white stamens with orange anthers. The tree likes deep, mellow soil. The leaves are somewhat reddish beneath. This tree, of course, comes from Japan.

PROPAGATION

Seeds. Sow the seed in the Spring after frost, or out-of-doors as soon as ripe.

Cuttings. Wood may be taken in July and rooted under glass.

Layers. They are also successful.

STYRAX—Snowbell

(Sty′-rax. From Arabian name, *assthirak*.)

Japanese Snowbell (Styrax), *Styrax japonica*. Native of Japan and China, and is successful in regions 1, 2, 6, 20, 22, 24, 25, 27 to 30. It has horizontal, very twiggy branches, and is a shrublike tree, 10 to 30 ft. tall. It is particularly hardy at Rochester, New York. It flowers in great profusion the middle of May, with white, bell-shaped blossoms, pendent on underside of branches, three to six in short branchlets. The leaves are oval, quite concavely curled, tapering, and shiny. The buds are usually superposed. The young twigs are pubescent, but soon become smooth. The twigs then become red. The bark cracks in a netted fashion and has a contrasting lighter layer beneath. The fruit is solid and oval. It thrives in well drained but low situations, with much water, and prefers slight shade to full exposure. If it is planted on a slope, the flowers may be better seen from below. It is best to use it in a protected group among trees. It is a trifle too compact. The young plants are more sensitive to the

The horizontal branches of the Japanese Snowbell, Styrax japonica, are loaded with drooping white flowers

cold, and the tips of smaller branchlets winterkill. It is difficult to transplant, so that the nurserymen grow it in pots or sell it with a ball of earth. There are several native sorts which are less showy.

Fragrant Snowbell, *Styrax obassia*. Native of Japan. This species has ascending branches, and grows to be 30 ft. tall. It seems like Magnolia in growth, foliage and twigs. The fragrant racemes of bloom are erect or sub-erect, pure white, with yellow anthers. The flowers are hidden somewhat by the bold leaves. The leaves are slightly circular shaped to broad-obovate, 3 to 8 in. long, abruptly pointed, rounded at the base, remotely-toothed above middle, sometimes three-pointed at the apex, smooth above, and densely hairy beneath. The young twigs are woolly hairy, but soon become smooth. The petioles cover the buds. The bark flakes back of annual growth, but the twigs appear smooth. The fruits are obovoid.

PROPAGATION

Seeds. Grows readily from the abundantly produced seed, which should be sown as soon as ripe, inasmuch as they often self-sow their seedlings. Seeds often lie dormant for the first year.

Grafting. Closely related to the *Halesia*, it is sometimes grafted upon that plant.

Layers. Common method when a few plants are wanted.

SYRINGA—Lilac

(Si-ring'-a. Name taken from the Greek for pipe or reed.)

Most of the species of Lilacs are, of course, considered shrubs even though they become large and can be trained into trees. Nevertheless, there are a few sorts which are essentially treelike. In other words, they have little tendency to sprout freely from the base but are inclined to make large trunks.

Inasmuch as this tree species and its varieties are very similar, this little table will serve to distinguish them:

Leaves narrow at base, ovate to ovate-lanceolate.....*S. pekinensis*
Leaves rounded at base, ovate to broad
  Leaves glabrous beneath, abruptly pointed, shrub....*S. amurensis*
  Leaves pubescent beneath, gradually pointed, tree....*S. japonica*

Amur Lilac, *Syringa amurensis* (*ligustrina*) (*sibirica*). Native of Manchuria. It is upright or spreading, only 12 ft. tall. It has yellowish-white, odorless flowers late in June. The corolla tubes are short, much

IT is normal for trees to produce a wide buttressed base. When trees do not have a flaring base it is indicative of the fact that the roots are not growing properly. Such trees are strangling themselves due to the fact that the roots are growing around each other.—F. A. BARTLETT.

like the Privet flowers, and are borne in panicles from the lateral buds. The leaves are ovate or oval and smooth. The bark is not unlike a Cherry. There are two end buds.

Variety *pekinensis*, the Peking Lilac, has a spreading habit. It comes from Northern China. The leaves are small, oblong and unlike those of the type, tapering at the base. The flowers are more abundant and in heavier clusters, and also are more ornamental. The branches are more slender, and the Winter buds are smaller. Its whole habit and appearance are lighter and more graceful. The inflorescence is smaller and more compact and less showy. It is very hardy and grows rapidly.

Variety *japonica*, the Japanese Lilac. A tree growing to be 30 ft. high. The leaves are rounded at the base, more or less pubescent beneath. The inflorescence is 12 in. long, and appears in June or July, with the odor of Privet flowers. It is successful in regions 1, 2, 3, 5, 6, 16, 19, 22 to 30.

PROPAGATION

Seeds. Species may be produced from seed.

Cuttings. Green and ripe wood can be used for cuttings in the Summer, and hardwood cuttings are easily rooted in Winter.

Budding. Although the shrubby Lilacs are frequently budded on Privet, the tree Lilacs are usually raised from seed.

TILIA—Linden (Basswood)

(Til-i-a. Name derived from ancient Greek name, *ptilon*, meaning a feather, referring to the nature of seed bracts; or from *tilai*, meaning light bodies floating in the air like wool or feathers.)

The Linden is usually a symmetrical tree. It has been especially revered by the Germans. Since earliest times it has been the tree under which judges have been seated when they delivered their sentences. In folklore the Linden has always been considered to be the abiding place of fairies and gnomes.

Common L.
T. vulgaris
Littleleaf
European L.
T. cordata
American L.
T. americana
Bigleaf
European L.
T. platyphyllos
Linden - - Tilia

TABLE OF LINDENS

1. Leaves smooth beneath at maturity or at least only hairy..... 2
1. Leaves woolly white beneath..... 6
2. Leaves hairy beneath, large, 2½ to 5 in. long.....*T. platyphyllos*
2. Leaves smooth beneath, except tufts of hairs in axils of leaves... 3
3. Leaves gray beneath, tertiary veins not prominent.....*T. cordata*
3. Leaves green beneath..... 4
4. Leaves lustrous above..... 5
4. Leaves dull above.....*T. vulgaris*
4. Coarsely toothed with long-pointed teeth.....*T. americana*
5. Finely toothed with sharp, short teeth.....*T. euchlora*
6. Branchlets and petioles smooth.....*T. heterophylla*
6. Branchlets and petioles hairy.....*T. tomentosa*

Species

American Linden (Lime) (Whitewood) (Basswood, taken from "bast" because ropes are made from the bark) (Bee-tree) (Lynn), *Tilia americana* (*glabra*). Native from Canada to Virginia and Alabama west to North Dakota, Kansas, and east Texas, and is successful in regions 1, 2, 21, 23 to 28. These are white, pendulous cymes, six to fifteen flowered, with a sweet fragrance. The leaves are alternate, two-ranked, broad-ovate, 4 to 8 in. long, abruptly pointed, heart-shaped base or straight across, coarsely-toothed. The branches are glabrous, often green. The bark is gray and firm. The buds are mucilaginous when chewed. The farmers in the Colonies often felled a tree in Midwinter so that the cattle could browse upon the branches. A large bract is grown to the peduncle of the fruits, which are nutlike and pendulous. The American Linden prefers a rich soil and endures some shade. It is quite often shabby due to insect attack, especially by plant lice, which cause sticky patches which catch the dust. It makes a vigorous growth, is a good bee tree, and is less tolerant of city conditions than many other trees. The wood is used for cheap furniture and innersoles of shoes. The tough inner bark is used to make fiber for mats and for cordage. It is root-pruned in the nursery. The bark heels quickly after pruning.

In one city (Greenwich, Connecticut) the trees are valued at approximately $25,000,000 by Dr. E. P. Felt.

Littleleaf European Linden, *Tilia cordata* (*microphylla*). Attains a height of 90 ft., with very dense head and numerous twigs. The leaves are slightly disk-shaped, 1 to 2½ in. long, often broader than long, abruptly pointed, heart-shaped base, sharply and finely toothed, somewhat lustrous above, grayish beneath. The branchlets may be little hairy at first, and brown. This species is often sold as *Tilia europaea*, as is also *Tilia platyphyllos* and *vulgaris*.

Crimean Linden, *Tilia euchlora* (*cordata*×*dasystyla*). Attains a height of 60 ft. The branches are slightly pendulous, and the tree is valued for its lustrous leaves and good habit. The leaves are roundish-ovate, 2 to 4 in. long, abruptly short-pointed, obliquely heart-shaped, finely and sharply toothed, lustrous above, and pale green and smooth beneath. The twigs are glabrous when young.

Beetree Linden (White Basswood), *Tilia heterophylla*. Native from West Virginia, to north Florida, Alabama and Indiana. It attains a height of 50 to 60 ft., even 90. It is 10 to 12 flowered. The leaves are large ovate, 3 to 5 in. long, gradually pointed, obliquely straight across, rarely heart-shaped, finely toothed; thick, white, densely woolly hair beneath. The branches are reddish or yellowish brown. It is found in rich woods, in limestone soil in Nature, and tolerates dense shade.

Bigleaf European Linden, *Tilia platyphyllos* (*grandifolia*). Native of Europe. It has a pyramid head, 120 ft. tall. It is the earliest to flower, with generally three-flowered, yellowish-white cymes. The leaves are roundish-ovate, 2½ to 5 in. long, abruptly pointed, obliquely heart-shaped at the base, sharply and regularly toothed, often dull above and light green and hairy beneath. The branchlets are hairy. It suffers often in dry seasons by dropping leaves. Sometimes this is sold as *Tilia europaea*, although *vulgaris* is the commoner one.

Silver Linden, *Tilia tomentosa* (*alba*) (*argentea*). Native of Southeastern Europe and Western Asia. It has a broad, pyramidal head, with habits rather similar to the Sugar Maple. It is 90 ft. tall. The leaves are almost circular, 2 to 4 in. long, abruptly pointed, heart-shaped or almost straight across at base, doubly toothed and often tending toward lobing, and white beneath. The young twigs are hairy. The fruits are slightly five-angled and minutely warty.

Common Linden (European Lime), *Tilia vulgaris* (*intermedia*) (*europaea*) (*cordata*×*platyphyllos*). It is successful in regions 1, 2, 6, 7 and 28. It is globular and symmetrical in shape, 120 ft. tall, and flowers in five- to ten-flowered pendulous cymes. The leaves are broad-ovate, 2¼ to 4 in. long, short pointed, obliquely heart-shaped base, glabrous above and below, except for axillary tufts of hair. The

branchlets are smooth. The tree is used for shade and for the lawn. The honey from its flowers is superior to most sorts.

PROPAGATION

Seeds. If the seed thoroughly dries it takes a year longer to germinate. Seedlings develop slowly.

Layering. The French cut down the tree and mound layer the shoots which sprout from the stump.

Grafting and budding. Rare sorts are grafted in the Spring or budded in August. Alfred Rehder says that grafted or layered trees remain one-sided for years because the branches have a tendency to make a horizontal instead of an upright growth.

ULMUS—Elm

(Derived from the Saxon word Elm, or Ulm, a name which is applied with slight alterations in all dialects of the Celtic tongue. Ulm is still one of the German names for the Elm, and the city of Ulm is said to derive its name from the great number of Elm trees that were growing near it. Loudon tells us that there are forty places in England mentioned in the Dooms-Day Book which take their names from that of the Elms, such as Barn Elms, Nine Elms and so forth.)

Few American trees are as greatly admired as the American Elm, which is found far and wide. The general neatness of habit and the clean foliage of all the Elms have placed them in the front rank of trees for the street, for shade, and for specimen planting.

SPECIES

American Elm (White Elm) (Water Elm) (Gray Elm), *Ulmus americana*. Native from Newfoundland to Florida, and west to foot of the Rockies, and is successful in regions 1, 2, 3, 4, 7, 12, 15, 16, 19, 21 to 30. It is 120 ft. tall. There are various forms commonly seen: The Umbrella form, the Vase form, the Plume form with one-sided development of drooping branches, the Oak form with a rounder head and the Feathered form with trunk covered with short twigs. The leaves are ovate-oblong, 3 to 6 in. long, sharp-pointed, unequal at base, doubly saw-toothed, glabrous or rough above. The bark is light gray, scaly, deeply fissured. The branchlets are pubescent when young. The winged fruits have hairy margins. The American Elm is called the Queen of the American trees, as the Oak is the King. It is used extensively on wide streets in the Northeastern States. It should not be planted on a narrow street. The wood is used for hubs, flooring and boat building. It prefers a rich, alluvial soil, as it is found on the rich, moist bottomlands. It is susceptible to the Elm-leaf beetle, tussock moth, leopard moth, borers, bark louse, bagworm, gipsy moth,

A noble specimen of the Feathered Vase form of the Elm with its trunks and branches clothed with short twigs

Dutch Elm disease, and brown-tail moth. Comparisons: from *Ulmus fulva*, it differs by having white layers in the bark.

A variety, the Moline Elm, is very rapid in growth, with very large leaves which often have a little leaflet at the base. This has come into great prominence in the last few years. It was introduced by Henry Klehm.

Smoothleaf Elm, *Ulmus foliacea*. Native of Europe, North Africa and West Asia, and successful in regions 1, 7, 8, 12 and 19. It is 90 ft. tall, and suckers. The bark is gray and deeply fissured. The branchlets are slender. The leaves are elliptic to ovate or obovate, pointed, very oblique at base, doubly saw-toothed, about twelve pairs of veins, lustrous and smooth.

Variety *dampieri*. Narrow pyramid. Leaves crowded on short branchlets. Broad-ovate; deeply, doubly round saw-toothed.

Variety *wredei*. Like *dampieri* but leaves yellowish.

Variety *wheatleyi*. Jersey Elm. Guernsey Elm. Stiffly erect branches, broader leaves, conspicuously tufted with hairs at axis of veins.

Variety *umbraculifera*. Dense globe. Branchlets slender, with elliptic leaves, often rather rough above.

Variety *koopmanni*. Similar to the variety *umbraculifera* but with oval head. Branchlets often corky. Leaves grayish beneath.

Slippery Elm (Red Elm) (Moose Elm), *Ulmus fulva* (*pubescens*). Grows 60 ft. tall, and has a rather flat-topped head. The leaves are obovate, 4 to 8 in. long, long-pointed, very unequal at base, doubly toothed, rough above, densely hairy beneath. The branches are difficult to break because of flexible bark. The twigs are hairy and rough, red-brown to orange. The bark is mucilaginous when chewed. It is said to be the American boys' first chewing gum. The buds are dark with long, rusty hairs. The Slippery Elm is found in low, rich soil, along streams and commonly in limestone. The wood is used for fence posts, railroad ties and wheel hubs. The bark is used for demulcent, and is somewhat nutritious as well as healing. Steeped in water, it is used to protect inflamed membranes of the throat. Comparisons: less drooping leaves than *Ulmus americana*, and the buds are dark.

Scotch Elm (Wych Elm) (English Elm), *Ulmus glabra* (*scabra*) (*campestris*) (*montana*). Native to Northern and Central Europe, and West Asia, and successful in regions 1 to 7, 19 and 28. It is of Oak-like habit, with firm bark, and grows to be 120 ft. tall. The leaves are short-petioled, oblong-obovate to elliptic or obovate, 3 to 6½ in. long, abruptly pointed, very unequal at base, sharply and doubly saw-toothed, rough above and hairy beneath. The bark remains smooth for years, hence *glabra*, which means smooth. The branchlets are hairy when young, dark reddish-brown. The buds are smoky and smoothish. The Scotch Elm is better for the streets than the American Elm because it is smaller. It is also good for timber to be used under water, such as ships, docks, and pumps. Prefers a moist and loamy soil, but is infested with same pests as the American Elm.

The Camperdown or Umbrella Elm, variety *camperdowni*, has pendulous branches and branchlets. It is one of the most interesting of the weeping trees. Its branches are strong and arise from the trunk at such an angle that this in time becomes first a broad umbrella and in old specimens almost a summer house. Of course, such an Elm as this must be grafted, and when grafted the head of the tree must be 7 to 8 ft. tall.

Chinese Elm, *Ulmus parvifolia* (*chinensis*). Native to Northern and Central China, Korea and Japan. It has a broad, round head, and is 45 ft. tall. The leaves are small, elliptic to ovate or obovate, 1 to 2 in. long, sharp or obtusish, simply or nearly simply saw-toothed, lustrous, smooth, and change to red or purple, except in mild climate where they remain green into Winter. The stipules at the base of the leaves, unlike those of the Dwarf Asiatic Elm, are narrow and linear. The branchlets are slender. The tree flowers in the Autumn. It is used a great deal in the southern part of Texas and Gulf Coast. Has the widest range of usefulness of any of the Elms.

Dwarf Asiatic Elm, *Ulmus pumila*. Native to Eastern Siberia and Northern China and Turkestan, and successful in regions 9, 10, 11, 13, 15 to 23. It grows 45 ft. tall, and has elliptic or elliptic-lanceolate leaves, 1 to 2 in. long, sharp-pointed, dark green, and smooth. The stipules at the base of the leaves are broad, almost heartshaped. The teeth are almost simple or with one smaller tooth. The bark is rough. The twigs are slender and hairy when young. This is erroneously cataloged as Chinese Elm, which is *U. parvifolia*.

Rock Elm (Cork Elm) (Hickory Elm), *Ulmus racemosa*. Native from Quebec to Tennessee, and west to Nebraska. It has short, spreading branches, and oblong-round top. It is of Hickorylike habit, with the trunk continuing to the crown, and growing to be 120 ft. high. The leaves are elliptic to oblong-obovate, 2 to 4 in. long, short-pointed, unequal at the base, doubly saw-toothed, glabrous or somewhat rough above, pubescent beneath, with very straight vines. The twigs are pubescent, and the second year develop corky angles. The wood is used for frames of chairs, hubs of wheels and railroad ties. It is of slow growth.

Propagation

Seeds. Sow the seeds as soon as ripe, as they soon lose their vitality, being one of the type of seeds in which the embryo is well developed within the seed and ready to grow. They usually ripen their seeds in May or June and are ready to germinate in July and August. *Ulmus parvifolia* ripens its seed in October and November.

Cuttings. Hardwood.

Grafting. Elms must be grafted or budded upon allied species with the American and Scotch Elms used as stocks. Whip grafting and splice grafting are used principally. Camperdown Elm is grafted on tall stems at a height of 7 to 8 ft., using *Ulmus glabra* as a stock. Grafting is done in May. It may be well to shape the head the first few seasons so as to keep it well balanced.

UNGNADIA—(Texas-, Spanish-, or Mexican-Buckeye)

(Oong-nod′-i-a. Named for Baron von Ungnad, who introduced the Horsechestnut to Europe.)

Texas-buckeye (*Ungnadia speciosa*). Native of Texas and of the family of Horsechestnut. It is only truly hardy in the Southern States. The trees grow 30 ft. tall but are often shrubby. There are lateral corymbs of pink flowers, which appear in March and May, according to locality. The leaves are alternate, odd feather-formed, five- to nine-parted, somewhat scalloped saw-toothed, ovate-oblong, 4 to 6 in. long. The branches are pubescent and reddish. They have leathery capsules with 3-angled seeds, which appear two months after flowering. The seeds lose their vitality quickly.

Propagation

Seeds. Sow the seeds as soon as ripe or they soon lose their vitality.

XANTHOCERAS—(Chinese Flowering-chestnut)

(Zan-thos′-er-as. Name derived from *zanthos,* meaning *yellow,* and *keras,* meaning *horn;* refers to the yellow, horn-like processes on disk at center of flower.)

Chinese Flowering-chestnut (*Xanthoceras sorbifolia*). Native to Northern China, shrublike tree with upright, stout branches, growing 24 ft. tall. There are racemes, 6 to 10 in. long, of thin-petaled flowers, which are white with blotch at base, changing from yellow to red. The flowers and the leaves expand together. The leaves are alternate, odd feather-formed, nine to seventeen leaflets, with leaves 6 to 12 in. long. They are lustrous and remain for a long time. The fruits are large capsules with thick walls, opening along three lines. The seeds are black, ½ in. in diameter. The trees are perfectly hardy. Abbe David, who introduced it, says that the seeds are eaten in China. It is fastidious as to soil, prefering a porous, loamy soil. It thrives in the sun. It is not attacked by insects. However, for some reason the plants often do not succeed, and it is difficult to transplant.

Propagation

Seeds. Oliver advises sowing each seed in a separate pot, and makes the observation that often the leaves of seedlings are pure white. If a greenhouse is available, they may also be sown indoors.

Root cuttings. Fleshy roots are cut into 3 in. lengths in the Fall and stored until February, after which they may be started in flats.

ZANTHOXYLUM

Zan-thox'-i-lum. Name derived from *xanthos*, meaning *yellow*, and *xylon*, meaning *wood*.)

Prickly-ash (Toothache-tree), *Zanthoxylum americanum*. Native from Quebec to Nebraska and Virginia. It is a small tree, often shrubby, only 24 ft. tall. The flowers are generally unisexual, the staminate and pistillate flowers on separate trees. They are borne in tiny, axillary clusters, and are yellowish-green. The leaves are alternate, odd saw-toothed, five to eleven leaflets, opposite, transparent and dotted. The wood is aromatic. The branchlets are hairy and have prickles ¼ in. long at the base of leaf stalk. The fruits are blackish. The bark and capsules are of hot, acrid taste. The soil must be well drained, and the tree must have sun.

PROPAGATION

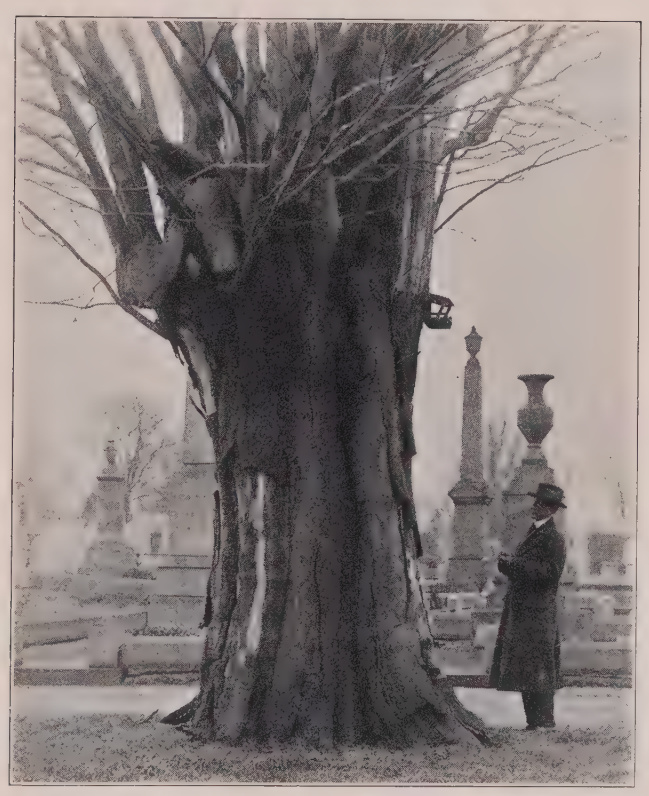
Seeds. The seeds may be sown soon after ripening, but the common method is by suckers.

Root cuttings. The plants are inclined to sucker and are therefore easily propagated by root cuttings.

ZELKOVA—(Keaki, the Japanese name)

(Zel-koh'-va. Zelkoua is its common name in Crete; in the Caucasus, it is called Selkwa.)

Sawleaf Zelkova, *Zelkova serrata*. It is a short, usually crooked, trunked tree, dividing into many upright or half-spreading stems. It has a broad, round-topped head, grows 90 ft. tall, and is absolutely hardy. The leaves are simply saw-toothed, ovate to oblong-ovate, 1 to 2 in. long or on strong shoots 5 in. long, pointed, round or rather, heart-shaped at base. There are eight to fourteen pairs of veins, with clean, handsome foliage. The bark is rather smooth, scaly. The twigs are smooth. It is said to have the trunk of a Beech and the leaf of an Elm. It is a good avenue or lawn tree, but the trunk is usually crooked. The wood is tough and elastic, and is used by the Jap-



Note the shaggy bark of an old Zelkova tree

anese for building jinrikishas. It is subject to San Jose Scale but free from other scales.

PROPAGATION

Seeds. Sow the seeds as soon as ripe.
Grafting. This may be grafted on the Elm.

To avoid dangerous corners, street and roadside trees should be planted so that there is a clear vision in all directions.

Chapter XXVII

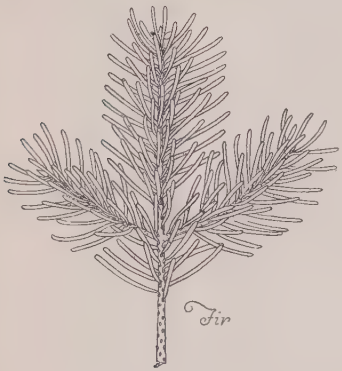
IMPORTANT CONIFEROUS TREES

ABIES—Fir

(Ay′-bees. From *abeo,* to rise; alludes to the aspiring habit of growth.)

Few of the evergreens are as beautiful as the various species of Firs. All of the trees form quite regular pyramids and have their branches in whorls. They are generally quick growing.

The bark, in most cases, is smooth and thin. The twigs are generally smooth, but in a few species they are grooved. The leaves are spirally arranged, but often form a flat spray. When the leaves shed from the branches, they leave a circular scar, which is not greatly elevated above the surface of the twig.



Comparisons. The leaves of the Spruces differ in several characteristics. Most of the leaves of the Fir are blunt at the end, sometimes notched and sometimes pointed, whereas, the leaves of the Spruces are attached to the twig upon corrugated ridges or cushion-like bases so that the branches always appear ridged. The leaves of Spruces are always sharp-pointed and harsh to the touch.

The Winter buds of Firs are generally coated with resin, which seems to appear as if it were exuding or painted upon the bud. The cones are oval to cylindrical, and are always erect. In the Spruces the cones are pendant.

Most of the Firs like good, moist soil, and are adapted to the cool northern regions, where they are quick growing. A Fir generally needs little pruning except to keep the plants compact, in which case the tip buds are removed upon the side of the trees which is making the most rapid or unsymmetrical growth.

Species

Balsam Fir (Blisterpine), *Abies balsamea.* The Balsam Fir is found native from Labrador to West Virginia, west to Minnesota and Iowa. The tree is hardy throughout the North. It has a narrow, pyramidal shape and grows to be 75 ft. tall. The bark is gray-brown, with blisters of resin. It is scaly on old trees. The buds are reddish and very resinous. The twigs are ashy gray. The foliage spreads upward, ½ to 1 in. long, dark green above, with two narrow white

bands beneath. The Balsam Fir is found native in steep ravines, but it is not successful outside its natural habitat. It is not good in cultivation, except when young.

Greek Fir (Cephalonian Fir), *Abies cephalonica*. As is indicated by the name, the Greek Fir is found native in Greece. It grows to be 100 ft. tall, and is found to thrive best south of New York State. The twigs are lustrous brown, and the buds are reddish and resinous. The bark is gray-brown. The leaves are rigid and sharp pointed, ½ to 1 in. long, and are slightly directed forward. They are green above, with two white bands beneath. The Greek Fir is injured by the February Sun.

Cilician Fir (Taurian Fir), *Abies cilicica*. The Cilician Fir is native of Asia Minor and North Syria. It is a pyramidal tree, with branches horizontal and tips ascending. It attains a height of 100 ft. The twigs are a trifle hairy, but the buds are not resinous. The bark is ashy gray. The leaves are in flat sprays, bright green, with two white bands beneath. They are 1 in. long, rounded or notched, and spreading upward and forward. The cones are red-brown, 7 to 9 in. long. The Cilician Fir is admirably adapted to the Northeast. It retains lower branches well. Compared with the Nordmann Fir, this is grayer in color and has shorter and more narrow leaves.

White Fir (Colorado Fir), *Abies concolor*. This is one of the best for general use, being vigorous and rapid in growth and having a cheerful color. It is native from Colorado to Southern California, and north to Mexico and New Mexico. It is hardy as far north as Massachusetts, New York, Iowa and Nebraska. It grows to be 120 ft. tall.

The twigs are yellowish-green, and the buds are round and resinous. The bark is smooth, gray, and deeply fissured on old trees. The leaves are irregularly arranged, 1½ to 2¼ in. long, sharp or rounded at the tip, and bluish-green. The cones are grayish-green, 3 to 5 in. long.

This tree is particularly good in the Eastern States. It makes good contrast with such evergreens as Hemlock and Pine. It requires a moist, good soil, but is not good in wet places. It tolerates heat and drought. It grows about 18 in. a year. In raising from seed, the Colorado type is said to be superior to many other strains. The New Mexico strain produces less hardy trees.

Variety *violacea* is an improvement which thrives especially well in culture. It has dark purple cones.

Needle Fir, *Abies holophylla*. This species does well in the Arnold Arboretum, growing to be 90 ft. tall. The twigs are smooth, grooved, and yellowish-gray. The buds are slightly resinous. The leaves are

The White Fir has the widest range of usefulness of any Fir

comblike below, spreading at right angles outward and upward, ¾ to 1½ in. long. The leaves are spiny-pointed on young plants, not so sharp on older trees. They are bright green, with two pale, whitish bands beneath. The cones are 5½ in. long.

Nikko Fir, *Abies homolepis* (*brachyphylla*). The Nikko Fir was found in Japan. It is a perfect pyramid, growing 90 ft. tall. It thrives in the Eastern States and south of Minnesota, North Dakota and Montana. It is hardier than the Balsam Fir. The twigs are smooth, gray and deeply grooved. The buds are oval and are resinous. The bark is scaly. The leaves are comblike below, crowded above, spreading outward and upward and forming a V-shaped depression. The outer ones are 1 to 1¼ in. long, middle ones shorter. They are rounded or

notched at tips, dark green above, with two broad bands beneath. The cones are purple, changing to dark brown, 3 to 4 in. long. To keep these trees compact, shear and remove tip buds.

Alpine Fir (Rocky Mountain Fir). *Abies lasiocarpa.* Found native in Alaska, Oregon, Utah and north to New Mexico, this tree is of a thick, conical growth. It does not do well in the Eastern States, but is splendid in Ottawa, Canada. It attains a height of 90 ft. The twigs are ashy gray, with short rusty hairs. The buds are small, oval and resinous. The bark is smooth, silver-grey, and in old trees it is grooved. The Alpine Fir is particularly good placed in groups, and it enjoys being protected from the midday sun.

The Arizona Fir (Silver Cork Fir). Variety *arizonica.* The bark is creamy white, thick, corky. A true test of this sort is that the bark feels corky. The leaves are whiter beneath and steel blue above.

Nordmann Fir, *Abies nordmanniana.* This tree is found native in Caucasia, Asia Minor and Greece. It attains a height of 150 ft., with a handsome, compact, broadly pyramidal shape. It is of slow growth until it is established. It does well south of New Hampshire, Michigan, Iowa and South Dakota. The twigs are gray; the buds are oval, pointed, but not resinous. The bark is gray-brown. The leaves are directed forward, densely covering the twigs. They are 1 to 1⅜ in. long, rounded or notched at the tips, and wide. They are shining dark green, with two white bands below. The cones are dark brown, 4 to 6 in. long.

It thrives in a clay loam, even in poorly drained soils, and is therefore good in the city. Snow does not seem to disarrange or break its branches. The leaves often are burned by Winter sun. It should be planted in protected places in colder regions and shaded from the sun. In Ohio its leader and tips sometimes freeze.

Silver Fir, *Abies pectinata* (*picea alba*). This species is a trifle tender in coldest States. It was found native in the mountains of China and Southern Europe. It is of a more open growth than *Abies nordmanniana.* It reaches a height of 150 ft. The twigs are gray, with short hairs. The buds are small, but are not resinous. The bark is gray, smooth and scaly on old trees. The leaves lie flat on the twigs. They are shorter at the top of the spray, pointing outward and upward, being ⅝ to 1¼ in. long, rounded and notched at the tip, shining, dark green, with two white bands beneath. The cones are 4 to 6 in. long. The Silver Fir is not good in the Eastern States. Loudon calls this "the most elegant and graceful of evergreens." It prefers a well protected place.

Veitch Fir, *Abies veitchi*. It is found native in China and Japan, slender and attains a height of only 75 ft. It is very hardy and is especially good south of North Dakota, Wisconsin and Minnesota. The twigs are brown and hairy. The buds are purple and very resinous. The bark is smooth, gray. The leaves are crowded, point forward and upward, and are nearly like a comb below, rounded or cut straight at the tip, dark shiny above, with two white bands beneath. The cone is cylindrical, bluish-purple when young, changing brown when older. The Veitch Fir is of rapid growth, and is picturesque and irregular in form. It thrives in the Eastern States. Pinch out the tips to make the trees retain compactness. However, it becomes thin with age.

PROPAGATION

Seeds. The seeds often germinate slowly, are of poor fertility and short vitality. They may be sown as soon as ripe, stratified until Spring, or stored dry during the Winter and sown in Spring.

Cuttings. Cuttings generally do not root easily because resin is freely produced and covers the cut end; at least, this is said to be the reason, although it may merely mean that we do not root them easily.

Grafting. Use veneer grafts (see page 154). Only upright branches or leaders should be used as scions, as the resulting trees are unsymmetrical when side shoots are used as scions.

ARAUCARIA—Monkeypuzzle, Norfolk-island-pine, Bunya-bunya.

(Ahr-au-kair'-i-a. From Arauco, a province of S. Chili.)

The Araucarias are a strange group of trees with whorled branches, and the leaves are quite sharp pointed. They are all tender and are grown only in the milder sections of the United States. One species, the Norfolk-island-pine, is grown in pots and greenhouses.

Monkeypuzzle, *Araucaria imbricata* (*araucana*). A native of Chili, the Monkeypuzzle is an odd tree, with whorled branches in fives, with a few side branches in pairs. It grows well from Virginia, Tennessee and Arkansas southward. It reaches a height of 80 ft. The leaves are alternate, decurrent, spiny and stiff. They are bright green. The bark of the trunk even holds leaves for twelve to fifteen years. The fruit is a flattened globular cone.

This tree is named Monkeypuzzle because it is said that a monkey can climb the tree but cannot descend, as the leaves point upward. However, the tree is rather too unique to be truly beautiful. Leaves

Note the strange branches of the Monkeypuzzle. The sharp pointed leaves all point forward

writes. "The horizontal arms, clothed in imbricated leaves, resemble, in young trees, snakes partly coiled round the trunk, and stretching forth their long, slender bodies in quest of prey."

Norfolk-island pine, *Araucaria excelsa*. Native of Norfolk Island, although it is frequently grown by florists as potted plants. In cultivation it reaches a height of 160 to 200 ft. In young plants the needle-like leaves are sharp, somewhat spreading, but in trees of great age the leaves are shorter and closer.

Bunya-bunya, *Araucaria bidwilli*. This is from Australia and grows to be 150 ft. tall. It is symmetrical, with strong, pendulous branches which sweep to the ground. It withstands some frosts in Florida. The leaves are contracted at the base, whereas those of *Araucaria excelsa* are broad at the base.

Propagation

Seeds. Seeds may be obtained from the import houses. Plants raised from seed are not satisfactory, since their low branches are short

and they are narrow at the base. Such plants are, however, useful as stocks or as a source of cuttings.

Cuttings. Good cuttings may be taken from the ripened tops of the seedlings during Winter or early Spring. When cut back, a plant sends up a group of leaders which are also useful for cuttings. The cuttings should have several tiers of branches. Wm. Hess, in the *Florists Exchange*, says that after the cuttings are taken, they should be allowed to dry out for a day, then potted with sharp sand in the top half of the pot and good soil in the bottom. Place them in a pro-

Showing the Norfolk-island-pine used as a pot plant

pagating case, keeping them cool (60 deg.), but covering the frame. In three weeks the cuttings will have rooted and should then be repotted into light soil, kept growing for a time in the greenhouse and then placed in lath houses.

Cuttings from side shoots do not make symmetrical plants, but they may be rooted, cut back and grown to furnish a source of leader cutting material.

Grafting. Hess writes: "Varieties *A. excelsa*, such as *compacta*, *robusta* and *baumanni*, are grafted either on seedlings or on misshaped plants of the species *excelsa*. The veneer graft is mostly used. In any case, graft low so that when the plant is repotted the union will come below the ground level and develop additional roots."

CEDRUS—True Cedars

(See′-drus. Kedros is the ancient name of a resinous tree.)

Many sorts of evergreens are known as Cedars, but these are the True Cedars. The Redcedar is a Juniper; the Whitecedar is an Arborvitae. Most of the other Cedars belong to the genus Cupressus. There are three species which are commonly grown. They are remarkable for their horizontal branching, and serve to make the Cedars very decorative trees as specimens in the landscape.

Like the Larches, many of the leaves are densely tufted or clustered on the Cedars. However, the leaves are spirally arranged and scattered on the long shoots. The leaves are sharp pointed, triangular and ridged. The bark is dark gray. The cones are upright and oval.

The True Cedars like a well drained soil, and in their Northern limits of culture, we find that hill plantings which insure perfect drainage result in perfect hardiness.

In pruning the Cedars do not remove the leaders. The splendid pyramidal form of the tree is thereby ruined, and the trees lose their character. The Cedars make rapid growth.

Species

Atlas Cedar, *Cedrus atlantica*. This species is a native of Northern Africa and hardy in New Jersey, West Virginia, Kentucky, Oklahoma and Southward. It has an upright leading shoot, and attains a height of 120 ft. When young the Atlas Cedar is open and seems sparse. The foliage is bluish-green and is less than 1 in. long. The cones are 2 to 2½ in. long. An exceedingly striking specimen tree. Variety *glauca* is splendid as far north as Long Island. The leaves are gray.

Variety *argentea* has silvery white leaves and scarcely differs from var. *glauca*. Variety *fastigiata* is a narrow pyramid or nearly a column.

Deodar (Sacred Indian-fir), *Cedrus deodara*. The Hindoos call this a sacred tree, Devadera, or Tree-of-God. They never use this tree to burn except as incense. The leading shoot is pendulous, and it is one of the most ornamental evergreens, growing to a height of 150 ft. It is particularly hardy on the Pacific Coast. The twigs are hairy. The leaves are dark bluish-green, 1 to 2 in. long. It thrives in a great variety of soil. The wood is fragrant and takes a high polish.

Cedar of Lebanon, *Cedrus libanotica*. This tree was found native in Asia Minor and Syria. It is hardy at the Arnold Arboretum and Rochester, New York. There is a tree on the lawn of the Rectory at Tichmarch in England which has a spread of 90 ft. and a height of 70 ft. It has an upright or spreading leading shoot, and the branches spread wider than the height of the tree, and they often rest on the ground. The tree attains a height of 120 ft. The leaves are dark or bright green, less than 1 in. long. The cones are 3 to 4 in. long. There used to be a curious old custom concerning this tree. Books were smeared with Cedar oil to prevent book worms. The Egyptians used the oil in embalming the dead. It is a picturesque tree when used in the landscape. However, it needs good soil which is warm and well drained.

Cedar of Lebanon

Variety *glauca* bears leaves which are bluish-white.

Transplanting. G. G. Nearing, Grubbs, Delaware, writes:

Of all evergreens the Cedar of Lebanon (*Cedrus libanotica*) is said to be one of the most difficult to transplant.

Planters have a number of theories about the transplanting trouble. It is supposed by some that when the taproot is cut the tree always dies. Others claim that after the taproot has been cut, the top leader will not grow upright until a new taproot forms. Many nurserymen simply use bad language and let the whole Cedrus group severely alone.

This is a mistake, because there are no more impressive trees when handled and placed correctly, and the other two Cedars do not resent moving to the same degree as the Lebanon. The writer grows all three. *Deodara*, though least hardy, transplants with little or no difficulty; next comes *atlantica*, hardier but more troublesome; and *libanotica*, hardiest of all, is least easy to move. A strangely unnatural sounding array of facts.

The truth is that, with proper care and attention, any and all of the Cedars can be handled without much risk. They must be root pruned every year (or at longest, every two years), beginning when they are 8 in. or 10 in. high. The taproot must be carefully cut each time, regardless of warnings to the contrary.

The same treatment should be applied to other touchy evergreens. The more frequently the roots are cut back the better they will branch, and the denser will be the mesh of roots in the ball. At least every other year they should be shifted from one row to another, for in no other way can you make sure that every root is trimmed.

Transplanting should be begun before the young trees reach a foot in height, for by that time they have already sent down a taproot at least 18 in.

This extra work costs money, of course, which the customer will —and should—pay for. Our best nurseries give similar treatment to many of the more common evergreens, and charge accordingly.

The Deodar, a True Cedar, has a pendulous leading shoot. The young trees are as broad as high

So much for well known general nursery practice. A second and equally important precaution will save nearly all Cedrus when observed along with the first. It applies to practically all southern species of evergreens which are to be planted near their northern limit of hardiness, such as, in the Northeastern States, *Libocedrus decurrens*, *Sequoia gigantea*, *Pinus excelsa*, *Cryptomeria japonica*, *Chamaecyparis lawsoniana*, *Taxus baccata*, *Torreya*, *Cephalotaxus*, and others.

These, for the most part, do not start active root growth in Spring until the sun has warmed the soil through and through. Top growth often begins early, it is true, and sometimes hardly stops even in Midwinter, but this is not accompanied by corresponding root activity.

Consequently, transplanting in early Spring is often fatal. That done in Autumn, when the sun has approached or passed its equinox, meets almost equal likelihood of disaster. For it is the great weakness of these trees that they do not properly prepare for Winter as the more northerly species do.

The proper time for moving trees of this type is, therefore, late May or August. In the case of Cedrus, the best time of all, according to the writer's experience, is June!

Nurserymen will naturally hesitate, thinking the long soft tips must wilt, but experience shows that, given plenty of water, they do no such thing. True, shipping so late has its dangers. Trees destined for distant planting must take their chances with earlier Spring or early Fall dates. For local planting, which means, of course, anywhere within trucking distance, the first half of June seems ideal.

Whether others of the tender evergreens will take kindly to this extreme late date is a matter of experiment. In some cases the end of May might be better. The one rule for all this type is to *move them as late as possible.*

What seems like hot weather to a northern nurseryman is but a temperate climate to trees brought from points where the sun mounts much higher and shines much hotter.

Just the opposite treatment should be given trees of great hardiness. *Picea canandensis*, *Tsuga canadensis*, *Pinus resinosa*, *P. mughus*, *P. strobus*, *Thuja occidentalis* and most Junipers transplant best in September or April, when the soil is cool and the sun low. They, of course, are not so sensitive, and may be handled safely over a much longer season.

Naturally, Cedrus or any other difficult tree should receive all possible care in the way of preparation of the soil, faithful watering (not every day, but a heavy soaking twice a week), protection from wind and wind-loosening, mulching or turning of the soil, and so on.

To be sure that Cedrus will thrive in heavy soil, it may pay, if the trees are never to be dug again, to dig a deep hole and roll in a couple of large rocks under each tree. While digging a row of *Cedrus atlantica* last year, the writer noticed that some had reached 3 ft. or

4 ft. and others hardly more than 1 ft. It was an easy and sure prediction that under every tall specimen would be found at least one large stone, while the small trees invariably grew in stoneless clay. Incidentally, this lot was moved with 100 per cent success between June 5 and 10, 1929, during a very dry time.

PROPAGATION

Seed. Store the seeds dry until Spring. The seed is short-lived. Sow the seeds in frames. They germinate in about six weeks.

Cuttings. Half ripe wood is used in late Summer or Fall in the greenhouse.

Grafting. Veneer graft on seedlings (see page 154).

CEPHALOTAXUS—Plum-yew

(Sef-al-oh-tax'-us. From *kephale*, head, refers to the male flowers being produced in heads, and *Taxus* which are like those of the Yew.)

The casual observer sees little difference between Cephalotaxus and the True Taxus or the Yew. The common species, *Cephalotaxus harringtonia* (*drupacea*) the Japanese Plum-yew, is a native of Japan. It is of a spreading habit, growing only 30 ft. tall, and thus is usually considered as a spreading shrub. It is hardy to Massachusetts, Indiana and Missouri. The twigs are opposite. The bark is dark gray and splits in strips. The leaves are spirally arranged but stand in two planes, forming a V-trough. They are linear, 1 to 1¾ in. long, abruptly pointed, and dark green, with two broad, gray bands beneath. The fruits are grayish-purple and berry-like. Avoid planting the Japanese Plum-yew where it gets the sweep of drying winds.

The leaves of the Cephalotaxus are similar to those of the Yew. Note the large fruits. (From catalog of Otto Boettcher, Germany)

Chinese Plum-yew, *Cephalotaxus fortunei*. This species was

named for Robert Fortune. It is 30 ft. tall, with reddish-brown bark. The branches are often pendulous, and it is more likely to be treelike than the Japanese Plum-yew, and is therefore more popular in cultivation. The leaves are gradually pointed and are 2 to 3 in. long.

For transplanting see Cedrus, page 363.

Propagation

Seed. Sow the seed in Autumn or stratify and sow in Spring. The conditions needed are, no doubt, like Taxus.

Cuttings. Spring or Fall rooted cuttings are used.

CHAMAECYPARIS—Retinospora (Retinispora)

(Kam-ee-sip′-a-ris. From *false* and *Cypress*. Ret-in-os′-por-a, or Ret-in-is′-por-a. From *resin* and *seed*, refers to the oily seeds.)

The various kinds of Retinospora are considered as shrubs, inasmuch as they are grown mainly for their beauty in the young stages of growth, but under most conditions the various species and varieties become less beautiful when they assume the size of trees. The foliage of a Retinospora varies greatly. Sometimes the foliage resembles that of the Juniper, the Cupressus, or even the Arborvitae. They differ from the Junipers and Arborvitaes by having globular cones. On page 32 a discussion of juvenile forms is found, which would be interesting to read to gain an understanding of variation found within this group of evergreens.

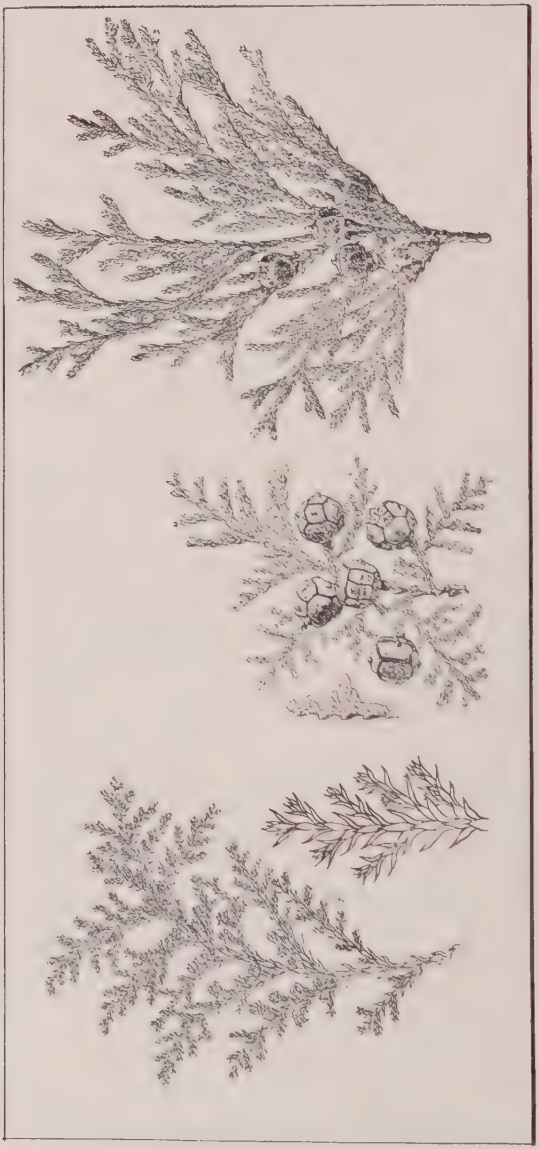
Species

Lawson Cypress (Port Orford Cedar), *Chamaecyparis lawsoniana*. This is native from Southwestern Oregon to Northwestern California, and it is hardy in Pennsylvania, Ohio and Oklahoma southward. It is variable in shape but in general is narrow pyramidal, growing to be 180 ft. tall. The twigs are flattened. The leaves are frond-like in horizontal planes, closely appressed, sharp, and resin dotted. They are green or gray. The Lawson Cypress does not do so well in dry climates.

Variety *glauca*, the Steel Lawson Cypress, has steel-blue foliage. Variety Triomphe de Boskoop belongs here. Variety *argentea*, the Silver Lawson Cypress, has silvery white foliage. Variety Silver Queen belongs here. Variety *lutea* has bright yellow, young growth.

There are several columnar varieties, namely:

Variety *erecta* (*erecta viridis*), the Green Column Cypress, bears vertical, bright green sprays of foliage. Variety *erecta glauca*, the Blue



Chamaecyparis or Retinospora. Note the characteristic globular cones

Left, Plume Retinospora, C. pisifera plumosa, has tiny pointed leaves which are spreading and the twigs feathery in appearance. Center, Hinoki Cypress, C. obtusa, has closely appressed, blunt leaves resembling those of an Arborvitae. Right, Nootka Cypress, C. nootkatensis, has sharp, spiny leaves produced in dense, blue-green sprays

Column Cypress, has blue-green leaves. Variety *allumi*, the Scarab Cypress, has steel-blue leaves.

Nootka Cypress (Yellow-cedar) (Sitka Cypress), *Chamaecyparis nootkatensis* (*Thujopsis borealis*). Native from Southwestern Alaska to Oregon, and hardy from New York, Indiana and Nebraska southward, the Nootka Cypress grows to be 120 ft. tall. The twigs are usually pendulous and are often four-angled. They are arranged vertically at top of tree. The leaves are dark green and are closely appressed but spreading on vigorous shoots. They are sharp, keeled and without resin dots. The Nootka Cypress thrives best in moist, well drained soil where it is protected from the winds. Variety *glauca*, the Blue Nootka Cypress has gray leaves.

Hinoki Cypress, *Chamaecyparis obtusa*. The Hinoki Cypress is native of Japan and is hardy except in Wisconsin, Minnesota and South Dakota. It grows to be 120 ft. tall. It is a broad pyramid, with horizontal and somewhat pendulous branches. The bark is

The lovely Hinoki Cypress has its leaves arranged in attractive, fanlike sprays. It is one of the handsomest of slow-growing evergreens

reddish-brown, peeling in thin strips. The twigs are rather horizontal, fan-shaped. The leaves are closely appressed, blunt, dark green above, and white marks below. The Hinoki Cypress is a favorite in Japanese gardens. However, it dislikes lime and prefers moist or rich soils, and it is not good in dry climates. It should be sheared to keep plants compact, although it needs it less than *Chamaecyparis pisifera* varieties. It is of slow growth so that reasonably large specimens are expensive. Cuttings are extremely slow to root.

The Cream Cypress, variety *albo-spica*, has young shoots creamy white. The Golden Hinoki Cypress, variety *aurea*, has golden leaves Variety *crippsi* has pale yellow leaves. The Yellowtip Hinoki Cypress, variety *gracilis aurea*, is slightly pendulous; the leaves are golden yellow at first. Variety *erecta* is very columnar. The Slender Hinoki Cypress, variety *gracilis*, forms a compact pyramid; the leaves are dark green; the twigs have pendulous tips. The Clubmoss Retinospora, variety *lycopodioides*, is of irregular habit; the twigs are golden and are not in one plane; a most unique form.

Sawara Cypress, *Chamaecyparis pisifera*. This species is a native of Japan and hardy everywhere except in the extreme North. It is 150 ft. tall and has horizontal branches. The twigs are flattened, in horizontal planes. The bark is red-brown, peeling in thin strips. The leaves are appressed, acuminate, and with slightly spreading tips. They are dark green above, with white lines beneath. The Sawara Cypress prefers moist, good soil and protected spots where the winds do not dry out the foliage in Winter. This tree soon becomes thin and loses its lower branches.

The Golden Sawara Cypress, variety *aurea*, has golden foliage and is hardier than the type. Variety *sulphurea* has light yellow leaves. The Thread Retinospora, variety *filifera*, has threadlike or cordlike twigs. The plants form a mound of dripping branches; it prefers a clay loam, and is of little beauty until 5 ft. or more tall. The Plume Retinospora, variety *plumosa*, forms a dense pyramid; the leaves are feathery slightly spreading; it is good on gravelly soil. The Goldenplume Retinospora, variety *plumosa aurea*, should be protected from the Winter sun because its golden foliage is more sensitive in the Winter.

The Moss Retinospora, variety *squarrosa* (*veitchi*), bears branches which are irregularly disposed; the leaves are gray, flat, and soft; the foliage has no resemblance to the type but is known as the juvenile form of foliage. (See page 32.) In regions poorly adapted to it, branches kill out in patches. Plant among taller trees. Do not shear plants to make plants so dense that the inner foliage is killed, but on the other hand, they may need shearing if plants are too open

to expose dead inner areas. It is not uncommon for ordinary *Chamaecyparis pisifera* shoots to arise from the older specimens; these should be removed. For an illustration showing the use of the Moss Retinospora in foundation planting, see page 62.

Whitecedar, *Chamaecyparis thyoides*, is a native from Maine to Florida west to Mississippi. It is hardy except in the extreme North. The cones are spherical, not irregular as in Arborvitaes. The bark is reddish-brown. The twigs are arranged irregularly. The leaves are closely appressed, spreading at tips on vigorous shoots. They are keeled, with prominent resin dots, and are dark blue or light green. It thrives best in cold swamps, but grows where other evergreens fail. It is the least attractive of the Retinosporas and is not ornamental.

Culture. The Retinosporas rather prefer the moister soils, but they should be well drained. Constant pruning is needed to keep them compact, and some species are only good when so treated. In the Midwest the young growth becomes dried in Spring because hot weather comes too suddenly. For this reason the sorts are well planted so as to be protected from the direct sun and strong winds, and the plants should be thoroughly watered in early Spring. See Cedrus for transplanting, page 365.

Propagation

Seed. Sow seed in Spring or in Winter in a cool greenhouse.

Cuttings. Cuttings root slowly in many species. Use frames or greenhouses with some bottom heat.

Grafting. Large cions may be used. See veneer grafts (page 154, also page 159) for special advice about the varieties.

FORTY LEAVES REQUIRED TO PRODUCE A FULL-GROWN APPLE

How many leaves are required to produce food enough to develop a full-grown Apple? This is a question that has attracted the attention of horticulturists in the United States Department of Agriculture for several years because of its relation to the practice of thinning Apples and Pears. Latest results of experimental work carried on with the Washington Experiment Station, at Wenatchee, Wash., indicate that from forty to fifty well-formed leaves are necessary to develop the fruit and furnish the necessary amount of food reserve for the growth of the tree.

CRYPTOMERIA

(Krip-toh-mair'-i-a. From *kryptos*, hidden, *meros*, part; meaning not known.)

The unusual beauty of the pyramidal Cryptomeria when planted as accent trees among lower evergreens and shrubs for attractive groups at the boundaries of a garden or when used as specimens, is appreciated by the lover of refined evergreens. The foliage closely resembles the Giant Sequoia. For transplanting, see Cedrus, page 365.

Note the awl-shaped leaves and the globular cones of the Cryptomeria. Young flower buds are seen at the tips of the branches.—(From catalog of Otto Boettcher, Germany)

Cryptomeria japonica is a native of Japan and China. It grows to be 150 ft. tall. The bark is reddish-brown, peeling in long shreds. The leaves are spirally arranged in five rows, directed forward and pointing inward. They are decurrent, awl-shaped, and $\frac{1}{4}$ to $\frac{3}{8}$ in. long. The fruit is brown and shaped like a flattened globe.

Variety *sinensis* is of looser habit, less hardy, and the tips freeze in the North.

Variety *lobbi* is more compact and the leaves are shorter, but little better than the type.

Propagation

Seeds. Sow seeds as soon as ripe, or store until Spring and sow when the soil becomes warm. Use a sandy, leafmold soil. They take four months to germinate.

Cuttings. Almost a year to root. Taken in Summer or Fall and inserted in sand in a greenhouse.

Grafting. The varieties may be grafted upon the type. See veneer grafting, pages 154 and 159.

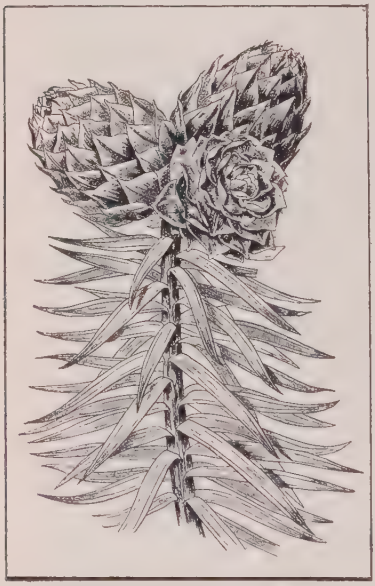
THE curious derivation of the name Pineapple is given by J. C. Loudon, who tells us that the pine cones were much used in Roman sculpture and called Pineapples, and this name has been transferred to the fruit from its resemblance to a pine cone.

This is one of the best varieties of Cryptomeria, known as C. japonica lobbi compacta

CUNNINGHAMIA—China-fir

(Kun-ning-ham′-i-a. After J. Cunningham, who discovered the tree in 1702.)

This rare tree grows to form a broad pyramid with spreading branches, which are pendulous at the ends. It is generally considered by the casual observer to be an Araucaria.



An unusual evergreen, the Cunninghamia, is seen with its cones —(From catalog of Otto Boettcher, Germany)

China-fir, *Cunninghamia lanceolata* (*chinensis*). This tree is a native of Southern and Western China. It is hardy in North Carolina, Tennessee, Texas and southward, and on the Pacific Coast. This is a rather rare species, with spreading branches, pendulous at the ends. It forms a broad pyramid. It grows 75 ft. high. The bark is brown, the inner bark being reddish. The leaves are evergreen, spirally arranged but forming two rows. They are crowded and broadly decurrent at the base, are sharply pointed, 1¼ to 2¼ in. long, shining above and with two broad white lines beneath. It sprouts from the stump.

PROPAGATION

Cuttings. Ripe or half ripe cuttings may be taken in Summer.

Layers. In the South this tree is rare, but European writers mention layers as a method of propagation.

CUPRESSUS—Cypress

(Keu-pres′-us. From Cyparissus, a handsome youth of Ceos, who was changed to a Cypress tree.)

Although there are many species of Cupressus, the ones which the modern botanist includes in this group are generally sorts which are not perfectly hardy in the extreme northern regions. Some of the Retinosporas have been called Cupressus. Generally, these trees are considered ornamental in their younger stages, although the Italian Cypress and the Monterey Cypress are frequently seen as tall trees.

The Monterey Cypress growing along the Pacific Coast in a very limited area.—(Photograph by courtesy of Better Homes and Gardens)

The Monterey Cypress, *Cupressus macrocarpa* (*lambertiana*), is found only in California south of Monterey. The British Museum has a record of a group of Buddhist monks who crossed the Pacific Ocean in an open boat many centuries ago. With them they brought seeds of a sacred tree which was growing in their secret monastery garden in Lhassa, Tibet. The monks planted the seeds at Point Lobos, near Monterey, and today they form one of the most picturesque features of the landscape in this neighborhood.

The tree grows 75 ft. tall, and is pyramidal when young but becomes broad with age. It may be planted in North Carolina, Tennessee, Arkansas, Texas and southward. The bark has scaly ridges. The twigs are often somewhat four-angled. The scalelike leaves are dark green, rhombic and blunt. The cones of all the species are globes and have six to twelve woody scales attached at their centers.

Arizona Cypress, *Cupressus arizonica* (*bonita*). It is hardy in

Virginia, Tennessee, Arkansas, Oklahoma, Texas and South. It is found native in Central and Southern Arizona. It forms a pyramid or columnar shape, and is over 40 ft. tall. The bark is red brown and makes thin flakes and long shreds. The twigs are rather stout. The leaves are sharp, thick keeled, with resin dots, and are rather gray. It tolerates drought.

Macnab Cypress, *Cupressus macnabiana* (*baker.*) It is found native in Southern Oregon and California, and it is hardiest of the Cupressus, grown in Massachusetts, Pennsylvania, Ohio, Missouri and southward. It is a bushy species and grows to be only 35 ft. tall. The twigs are very slender. The leaves are obtuse, with a conspicuous resin dot, and dark green or grayish.

A spray of foliage and cones of the Italian Cypress—(From catalog of Otto Boettcher, Germany)

Italian Cypress, *Cupressus sempervirens.* This plant is native of Southern Europe and Western Asia and has been cultivated almost since time immemorial. It is hardy in North Carolina, Tennessee, Arkansas, Texas and South, and on the Pacific Coast. It has erect or horizontal branches. It resembles the form of a Lombardy Poplar. It attains a height of 75 ft. and the twigs are often four-angled. The leaves are dark green and blunt.

Egyptians used the wood for mummy cases. It is a symbol of durability. A statue of Jupiter, made from Italian Cypress wood and 600 years old, is still without decay. Turks plant one Cypress at head and one at foot of each grave, so that cemeteries look like forests of Cypress. Loudon says: "Perhaps the oldest tree in the world is the Cypress of Soma, in Lombardy. It is said to have been planted, according to an ancient chronicle at Milan, in the time of Julius Caesar, B.C. 42. Napoleon, when laying down the plan for his great road over the Simplon, diverged from the straight line to avoid injuring this tree."

Variety *stricta*, the Columnar Italian Cypress. It takes the shape of a column and is the most commonly seen form. It is so common in California that its misuse is very obvious. Some neighborhoods are so dotted with these trees that their abundance may be compared to a page of exclamation points.

PROPAGATION. Seed. Sow the seeds in the Spring. (See Chamaecyparis, page 371.)

JUNIPERUS—Juniper, Redcedar

(Jeu-nip′-e-rus. Ancient Latin name.)

All ancient writers considered the shade of a Juniper tree hurtful to men as well as to crops, but throughout the centuries the berries have had reputed virtues.

The foliage of the Juniper is so different in the various species that one almost needs to learn each species of Juniper by heart so that he may surely tell whether it is a Juniper, a Cupressus, or a Retinospora.

The foliage is sometimes opposite and sometimes the leaves are arranged in whorls of three. The foliage may be needlelike or scalelike, and many varieties have both needlelike and scalelike leaves upon the same tree. For the points of distinction between the Juniper, the Chamaecyparis and the Thuja, see page 32.

Juniper bark is usually thin and scaly. The fruit of a Juniper is always a berrylike cone.

Junipers enjoy the loamy or lighter types of soil. When grown in a heavy soil, it may be well to add sand and lime.

SPECIES

Chinese Juniper, *Juniperus chinensis*. The Chinese Juniper is is found in China, Mongolia and Japan, and grows in New York, southern Michigan, Missouri, Nebraska, and southward. It grows 60 ft. tall. The branches are ascending, and it takes the form of a pyramidal head. The type in the Arnold Arboretum is columnar. However, there are often two kinds of leaves; those scaly at the tip of the twig, and those sharp-pointed at the base. The berries are brown, with a thick, mealy bloom. It is often subject to redspider.

The Conical Chinese Juniper, variety *mas* (*neoboracensis*), forms a dense column, and has mostly sharp leaves.

Variety *pyramidalis* forms a very compact narrow pyramid. It has crowded upright twigs. The leaves are in threes and are sharp, of a gray color.

The Chinese Column Juniper, variety *columnaris*, was introduced by the United States Department of Agriculture by F. N. Meyer. It forms a narrow pyramid. All the leaves are sharp-pointed, light bluish-green. It is one of the most beautiful sorts, of rapid growth and perfectly hardy. There seem to be two forms, a blue and a green.

Common Juniper, *Juniperus communis*. This is usually a shrub except for a few varieties. It is hardy in Canada and in the coldest regions. The leaves are linear and awl-shaped, tapering to a sharp point, with one broad white band, and they are keeled below. The fruits are black. It prefers a moist soil, but the soil must be well drained. It should be watered in Summer.

The Irish Juniper, variety *hibernica*, is a columnar sort with leaves which are short and dark green. They are less spreading, tips of twigs more upright than the next variety.

Note the spire-like growth of the Irish Juniper

The Swedish Juniper, variety *suecica*, has longer leaves than the Irish J., bluish-green color, spreading, tips of twigs nodding.

Variety *ashfordi* is pyramidal in form, flaring at the top.

Heavy snows destroy the form of the Irish and Swedish Junipers unless they are tied together in Winter. Some place a permanent tall stake or iron pipe in the center and tie the branches to it.

Syrian Juniper, *Juniperus drupacea*. This is a native of Greece and Asia Minor and is hardy in Virginia, Tennessee, Arkansas, the South and the Pacific Coast. It is pyramidal or columnar, rising to 60 ft. The twigs are triangular with prominent ridges. The leaves are linear-lanceolate, widest at the base, sharp-pointed, with two white bands above and have a broad green midrib. It is partial to limestone.

Formosa Juniper, *Juniperus formosana*. This species is native of Formosa and China, and it is hardy in Pennsylvania, Ohio, Missouri, Kansas, the South and the Pacific Coast. It has several trunks. The branches are upright and it has pendulous twigs. It attains a height of 35 ft. The leaves are directed forward, linear, spiny-pointed, ½ to 1 in. long, with broad white bands above and keeled below. The fruit is dark brown.

Colorado Juniper (Western Redcedar), *Juniperus scopulorum*. This is native from Alberta to British Columbia, south and west to Texas, and north to Arizona and Oregon. It is hardy except in the extreme North. The Colorado Juniper has a short trunk, often several, and has a round-topped head. It grows to be 35 ft. high. The leaves are rhombic-ovate, sharp pointed, closely appressed, and gray or dark green. The fruits are bright blue. It is especially splendid in the Rocky Mountain regions. Some strains are badly affected with red-spider. This species also becomes rather leggy.

Variety *argentea* forms a narrow pyramid and has silvery white foliage.

Variety *viridifolia* is a pyramid with bright green foliage.

Redcedar, *Juniperus virginiana*. This is extremely hardy and is found native from Canada to Florida and east of the Rockies. The tree is variable, being upright or spreading. It attains a height of 90 ft. The twigs are slender and the bark is reddish-brown. The leaves are scalelike, often with a gland on the back. The leaves are pointed, concave, and gray above. It grows best in poor, sandy soils. The wood is used for lead pencils and cedar chests. Sometimes newly transplanted trees are a bit slow to take a hold of the soil.

Variety *pyramidalis* forms a dense column.

Variety *schotti* is a narrow pyramid with bright green, scalelike leaves, yellower than *cannarti*.

One form of the Redcedar, Juniperus virginiana. This is an extremely variable sort as it grows in the wild and it has given rise to numerous varieties

The Canaert Redcedar, variety *canaerti*, forms a pyramid, compact, dark green. It has an abundance of bluish berries, and it is of rapid growth. It is a trifle less regular than the type; that is, more graceful.

Variety *filifera* is a broad pyramid with slender, much divided threadlike twigs. The leaves are blue-gray.

Variety *burki* is a real pyramid, but is gray like the variety *glauca*.

The Silver Redcedar, variety *glauca*, is a loose pyramid with gray leaves. It is not subject to red spider. It is one of the most handsome gray evergreens. Varies in habit, depending upon how it was first trained in the nursery.

The Goldtip Redcedar, variety *elegantissima*, is a pyramid and the tips of the twigs are golden.

Variety *keteleeri* has light green foliage and its growth is rapid, forming a column. It is free from disease. The berries are the size of a pea and blue-gray.

Juniper Blight

Richard P. White, of New Jersey Agricultural Experiment Station, writes:

Juniper blight, while just recognized on the Juniper, is not limited to this genus of evergreens. Over thirty coniferous species, representing fourteen genera, are known to be naturally infected with the organism causing Juniper blight.

The following is the list of genera known to be susceptible to infection under natural conditions: *Abies*, *Cephalotaxus*, *Chamaecyparis*, *Cryptomeria*, *Cupressus*, *Juniperus*, *Larix*, *Pseudotsuga*, *Sequoia*, *Taxodium*, *Taxus*, *Thuja*, *Thujopsis*, *Tsuga*.

In addition to this list, it is well to note that various species of *Picea* have been found this season with an organism very closely related, if not identical, to *Phomopsis juniperovora*, the cause of Juniper blight, causing definite cankers on the main stem and main laterals.

Of these genera, Juniperus is undoubtedly the most susceptible, and the following species have been found naturally infected: *Chinensis*, *communis*, *excelsa*, *sabina*, *scopulorum*, *squamata* and *virginiana*. Of these species, the *virginiana* types and varieties as a group are most susceptible, although there are apparently resistant varieties even here. The *excelsa* varieties have supposedly been immune, but one case was found in 1927 where a very light infection has taken place. Seedlings from seed collected in the Platte River region are evidently more susceptible to blight than seedlings grown from seed from other localities.

This disease is primarily one of seedlings, although it has been reported on trees of ornamental plantings that were 8 to 10 ft. high. It has also been observed on native Redcedar in Wisconsin. The disease becomes progressively less serious, however, as the trees become older, and as a rule no serious damage results on trees over four to five years old.

Infection takes place during wet or cloudy, damp periods, on the tips of branches. After the fungus has gained entrance to the tissues of the growing tip, it spreads or grows downward within the bark. Eventually the twig will be killed. The fungus does not stop at the base of this twig, but continues to grow in the cortex of the branch from which it had its origin. It girdles this branch and, suddenly, the whole branch dies. If left alone the fungus will reach the main stem of the seedling, will girdle it and cause the death of the entire plant.

In the dead twigs and branches, the fungus produces millions of spores, which corresponds to the seeds of higher plants. During wet

periods these spores ooze out from their containers in the branches and are spread, by wind, rain and laborers, to other plants.

The fungus passes the Winter in dead plant tissue which was cut out during the preceding growing season and allowed to remain on the ground. It also overwinters on infected specimens in the environs of the nursery. It is probably from this source that seed beds originally become infected, although there is a possibility that dead branch tips, usually accompanying the seed when bought, bring it into the seed bed where the seed is sown.

Wet seasons enhance the disease for several reasons: (1) spore production, dissemination and germination are dependent on moisture to a large extent; (2) abundant soil moisture tends to produce rapid growth, which is softer and more easily invaded by the fungus; (3) protective sprays are washed off more readily and cannot be renewed as frequently.

Dry atmospheric conditions prevent, to some degree, the dissemination, or spread, of the spores and also hinder spore germination.

In discussing control measures, it is well to keep the following facts in mind: (1) the ability of the fungus to attack a wide variety of coniferous species; (2) its extensive geographical distribution; (3) the difference in susceptibility of various species; (4) the importance of seed source; (5) the condition of seed at the time of purchase; (6) methods of overwintering, and (7) the limitations of spraying as a control measure.

Much can be done in controlling this disease by careful sanitation of the nursery; that is, cleaning up and burning all refuse. Keep the dead twigs cut from seedling beds and transplant blocks, as well as older blocks of stock, picked up and burnt. Use resistant varieties if possible and discard the more susceptible ones. Determine the seed source of the *virginiana* seed and, if possible, obtain seed from regions other than the Platte river. Insist, of the dealer, that all dead debris in the seed be fanned out. No one has made a survey of the native Redcedar in the various localities where seed is collected to determine the extent that native trees are infected. In view of the fact that the disease has been observed on native Redcedar in Wisconsin, cleaning the seed is a desirable practice.

Spray regularly and frequently with Bordeaux mixture, plus from three to four pounds of sticker to fifty gallons of spray. Since infection takes place in the young tips, it is important to keep these tips covered with spray. Spraying before a rain is advisable, because it is during rain and immediately following that the spores are spread and infection takes place. Kayso or flour has served the purpose well as spreader and sticker.

Propagation

Seed. Free the seeds from the pulp. Stratify during the Winter at a temperature of 32 to 50 degrees for one or two months. They

like a sandy seed bed. It is usually said that it takes two years to bring about germination, but the after ripening period is the important factor in speedy germination. (See page 128.)

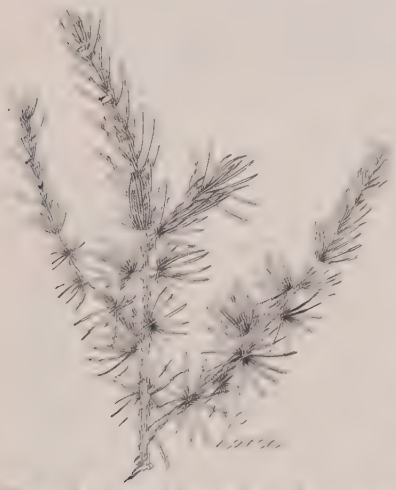
Cuttings. Cuttings generally root slowly, sometimes two years. Use a mixture of sand and peat moss, especially for the varieties of *Juniperus chinensis* and *J. communis*.

Grafting. Veneer grafts are used with many popular varieties because of slowness of rooting. (See page 154.)

LARIX—Larch

(Lar'ix. Ancient Latin name. From lar, fat, the tree produces resin.)

Although the Larches shed their leaves during the Winter, yet they are conifers. The branches of the Larch are horizontal and when seen against the Winter sky they are decorated by interesting globular cones. The bark is thick and scaly. The leaves are densely clustered on the shoots as well as spirals arranged upon the long, strong shoots.



Note that some leaves of the Larch are produced in clusters and that clusters are arranged spirally on strong terminal shoots

European Larch, *Larix europaea* (*decidua*). A native of Northern and Southern Europe, this Larch is hardy except in the coldest regions. It is a pyramid, but with age becomes irregular. The branches spread horizontally from the straight trunk. It grows to be 100 ft. tall. The twigs are yellowish, slender, smooth, and more or less pendulous. The bark is dark gray-brown. The leaves are flat, little over 1 in. long, and keeled below. They are bright green, turning coppery in the Spring and Fall.

The European Larch prefers light sandy soil which is well drained, and thus is unlike the American Larch. The wood has longer fibers which

The European Larch has rather pendulous twigs and forms an interesting conifer which sheds its leaves

make it difficult to split. It makes a rapid growth. Do not transplant this species except in Autumn or very early Spring, for it is almost fatal when the buds expand.

American Larch (Tamarack) (Hackamatack), *Larix laricina* (*americana*). It is native from Canada south to Pennsylvania, west to Manitoba and Illinois. It is extremely hardy. The tree attains a height of 60 ft. The twigs are reddish-yellow and the bark is red-brown. The leaves are 1 to 1½ in. long, blunt, and bluish-green. It prefers a very damp, swampy soil, but it does well in ordinary soil.

Japanese Larch, *Larix leptolepis* (*kaempferi*) is smaller in growth than the others. The branches are longer and more spreading and ascending. It grows rapidly. The leaves are broader than those of the European Larch, ½ to 1½ in. long, blue-green or light. The

under surface of the leaves has a white band. It thrives in light, moist soils. It succeeds in Ottawa, Canada.

PROPAGATION

Seed. Keep the seeds dry during the Winter and sow the seeds in Spring.

Grafting. Use *L. europaea* as a stock for grafting unusual varieties.

LIBOCEDRUS—Incense-cedar

(Ly-boh-cee′-drus. From *libas*, drop or tear, and Cedrus, referring to resin.)

The Incense-cedar, *Libocedrus decurrens*, is a tree which resembles an Arborvitae and grows 135 ft. tall, with foliage very similar to the Arborvitae. It is quite hardy, growing in Pennsylvania, Ohio, Indiana, Missouri and southward.

The trees are columnar becoming gradually spreading and irregular with age. It is difficult to understand why this tree is so seldom cultivated. They are natives of Oegon to Western Nevada and Southern California. The bark is scaly, cinnamon red. The leaves are scalelike and are bright green on both sides, and the leaves extend down the twigs from the base of each leaf. The cones are made up of from five to six woody scales.

For transplanting, see page 365.

PROPAGATION

Seed. Sow seeds in the Spring.

Cuttings. Very slow rooting. Take them in late Summer.

Grafting. Thuja and Chamaecyparis may be used as stocks.

Libocedrus decurrens: Foliage and cones. a, Ripe, partly opened cones; b, branch with male flowers; c, seeds and their wings—(From U. S. D. A. Bulletin 680)

PICEA—Spruce

(Py'-see-a. From the Latin *pix*, pitch.)

The Spruces are attractive pyramidal evergreens which introduce a horizontal note wherever they are planted in the landscape. The branches are in whorls. The twigs are deeply grooved. Each leaf sits on a cushion-like growth so that the twigs appear corrugated. The leaves are spirally arranged, usually four-angled, mostly sharp pointed. The cones are oval or cylindrical, and they are pendulous. See illustration, page 388; for comparison with the Firs, see Abies, page 355.

It may be said that the Spruces generally like cool conditions. They are not as adaptable to dry and poor soil as the Pines but like sandy loams where there is plenty of moisture flowing through the soil. For this reason they are ideally adapted to hillsides. To induce compactness in the Spruce, their tip buds may be removed in the Spring. It is also possible to induce compactness by taking out tip buds of the leader. Inasmuch as there are buds all along the leader, the Spruce have the ability to form new leaders. Whenever the entire new leader shoot is destroyed or broken, it is possible to induce a horizontal branch to assume the role of a leader by tying it to a stake.

The Spruces are usually subject to red spider. For this reason it is wise to spray them frequently with either water or one of the miscible oils.

Species

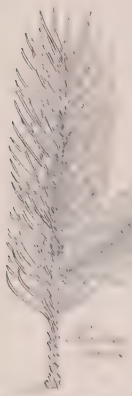
White Spruce (Often incorrectly called Black Hills Spruce) (Cat, Skunk, Labrador Spruce), *Picea canadensis* (*glauca*) (*alba*). It is a native from Labrador to Alaska, south to Montana, Minnesota and New York. It is extremely hardy. It has ascending branches and pendulous twigs forming a conical tree and is one of the handsomest of native evergreens. The White Spruce attains a height of 90 ft. The twigs are grayish or pale brown, and the bark is grayish and scaly. The leaves are 3/8 to 3/4 in. long, slightly sharp, and bluish-green, although it greatly varies in color. The leaves also have a strong odor. The cones are 1½ to 2 in. long. It thrives well on the seashore and in cool, moist, well drained soil. It is used as a windbreak and for specimens, and also on sides of hills and for tall backgrounds. For transplanting, see Cedrus, page 365.

Alcock Spruce, *Picea alcockiana* (*bicolor*). It is native of Japan and grows from Southern Ontario through New England. The branches are horizontal and slender, and the trees make a splendid appearance when young. The tree attains a height of from 80 to 150 ft. The

bark is dark gray. The leaves are slightly ridged on both sides, are dark green above and shining silvery beneath, somewhat curved. The cones are bright red when young. The Alcock Spruce grows well in Eastern States.

Engelmann Spruce, *Picea engelmanni*. This Spruce is found native in British Columbia and Alberta to Oregon, Arizona and New Mexico. It is extremely hardy. The branches are in close whorls and the tree forms a dense pyramid. "The best Spruce in the Arnold Arboretum" is its standing. It becomes 150 ft. tall. The leaves are slender, ½ to 1 in. long, and are sharp pointed. They are bluish-green and have a disagreeable odor when crushed. They are not as harsh to touch as the Colorado Spruce. The cones are sometimes 3 in. long. The Engelmann Spruce thrives best in clay loam, but it does not do so well in sandy soils. This is a splendid species, retaining its branches many years in cultivation. It cannot tolerate hot, dry winds, and the frost nips the soft growth in the Midwest. It prefers colder climates.

The Engelmann Spruce is one of the best sorts which retains its lower branches for years



Note that Spruce leaves, unlike those of a Fir, shed in such a way that the twigs are rough

Norway Spruce, *Picea excelsa* (*abies*). This is native of Northern and Central Europe, and it is hardy in the North. It is the most commonly planted Spruce. The branches are spreading, with pendulous twigs, but it has a dingy, dull color. It attains a height of 150 ft. The bark is reddish-brown. The leaves are less than 1 in. long, sharp, and are a lustrous dark green. The fruit is pendulous. This species needs a fairly moist soil. It is used as a windbreak, but loses its beauty when old. It is attacked by red spider. The trees should be planted at least 50 ft. apart.

Serbian Spruce, *Picea omorika*. With short, spreading branches, and forming a dense narrow pyramid, the Serbian Spruce is native of South-eastern Europe, and it is hardy except in the extreme Northern States. The twigs are brown and hairy. The foliage is flat, keeled at both sides, and ends in an abrupt point. It is silvery above and dark green below, making an attractive contrast. It prefers a moist but well drained, deep, rich and limestone soil. It is of slow growth but is good in the Eastern States.

Oriental Spruce, *Picea orientalis*. This is a graceful, compact and dark colored evergreen, with spreading and ascending branches. It is native of Caucasia and Asia Minor, and is hardy except in the extreme North. It grows to be 120 ft. tall and has brown, scaly bark. The flowers look like red candles. The leaves are stout, straight, short, being only $\frac{1}{4}$ to $\frac{1}{2}$ in. long, and are not sharp pointed; therefore, unlike most Spruces, the leaves are not harsh to the touch. They are lustrous dark green. The cones are cylindrical. They prefer a rich loam, and the tree likes a little shade to prevent burning in Winter. It is of slow growth but retains its lower branches. The Oriental Spruce does not scorch in early Spring.

Tigertail Spruce, *Picea polita*. This species is very distinct, having ferociously sharp leaves. It is native of Japan and is hardy in Ohio, Missouri, Kansas and southward. It is 90 ft. tall. The twigs are stout, pale yellow and smooth. The Winter buds are conspicuous dark brown and pointed. The bark is gray and rough. The leaves are very rigid, spiny pointed, and $\frac{1}{2}$ to 1 in. long. The fruits are showy, long, light green cones. The Tigertail Spruce thrives in moist, rich soil. It is of slow growth.

Colorado Spruce, *Picea pungens*. This species has horizontal branches and is found wild in Colorado to New Mexico, Utah and

Wyoming. It is very hardy, attaining 90 ft. The twigs are smooth and yellow-brown. The leaves are rigid, 1 to 1¼ in. long, sharp, spiny pointed, and bluish-green. The fruits are nearly 4 in. long. The Colorado Spruce is subject to red spider. It soon loses the lower branches in cultivation. Dunbar says that a tree thirty years old has quarter of its trunk exposed through death of the lower branches.

Variety *viridus*. The leaves are green.

Variety *glauca pendula*. The leaves are bluish-green and it has drooping branches.

Variety *kosteriana*. It has pendulous branches and bluish leaves. Some call this a triumph of Nature because of its deep blue leaves, regular and symmetrical growth. Others contend that it is too bold for small plantings and remark that it shouts loudly from the midst of any planting. This is called the Koster Blue Spruce.

PROPAGATION

Seed. Stratify the seeds at a temperature of 32 to 50 degrees for one or two months and sow in the Spring. See page 139. The seedlings of the Colorado Spruce, *P. pungens*, vary greatly in their degree of blueness; some are almost as blue as the Koster Spruce.

Cuttings. Many nurseries are attempting to root Spruces from cuttings, and although a few are successful, their commercial percentages are not as large as desired. Apparently, there is much to learn about these cuttings.

Grafting. The Colorado Blue Spruce is grafted upon *Picea alba*, *P. excelsa* and *P. pungens*. (See page 160.)

PINUS—Pine

(Py'-nus. Ancient Greek name was *Pinos* which came from word for *fat*, because the species furnish pitch and tar.)

In mythology the story of the origin of the Pine is one of tragedy. Legend says that the nymph Pitys was beloved by Pan but slighted the passion of Boreas, the wind, and was dashed against a rock. At this, Pan caused the Pine tree to spring from her remains.

The Egyptians considered the Pine as an emblem of the soul. When our Pilgrim fathers landed at Plymouth, the sight of the Pine tree, with its green needles, was very welcome. So deeply were they impressed that they used it upon the Pine tree shillings, and finally it was accepted as part of the seal of the commonwealth of Massachusetts. Today Maine is known as the Pine Tree State.

There are about eighty species of Pines. The Pines have whorled, spreading branches and long, needlelike leaves, which are borne in clusters of from one to five. Curiously enough, the botanist describes

a second sort of leaf, which is scalelike, but the casual observer would not notice these leaves or consider them as leaves. The bark of a Pine is furrowed or scaly. The buds have numerous scales.

The Pines are pollinated by the wind. The male and female organs being in separate flowers, the pollen has two tiny bladders which cause it to be carried widely by the wind. It takes two years for a Pine to ripen its cones.

Pines like a rich, well drained, sandy loam. They tolerate a dry soil but do not like clays. It is natural for the Pine to have tap roots, so that they are often intolerant of shallow soil.

If great compactness is desired in a Pine, the leaders at the tip buds may be removed. Many of the Pines are more interesting because of their irregular habit of growth. Therefore, the removal of leaders often adds to the picturesque form of the trees.

Some nurserymen say that the Pines are most ideally transplanted after they have started root action in the Spring.

Note the long, drooping needles of the Himalayan Pine

The Limber Pine has very flexible twigs and short needles in clusters of five

Five Needle Pines

Swiss Stone Pine, *Pinus cembra*. This Pine has short branches and is called the Lombardy Poplar of Pines. It lives a long life, sometimes several centuries, making a very slow growth, only 6 in. in a year, compared to 18 in. in the White Pine. It is native of the Alps and of Central Europe, Northeastern Russia, and Northern Asia. It is not injured by the coldest weather. Although it is sometimes 75 ft. tall, it is usually seen smaller. The twigs are densely brown and hairy. The needles are straight, 2 to 4¾ in. long, in bundles of five, slightly toothed, and dark green. In natural surroundings the Swiss Stone Pine is found in the poorest soils and in exposed places where no other Pines will exist. The Swiss carve figures from the wood. It does not lose its lower branches and is considered easy to transplant in large sizes.

Himalayan Pine (Botan or Bhotan Pine) (Drooping Pine), *Pinus excelsa*. This species forms a pyramid but is broad and open, with

wide and spreading branches. The needles are drooping. It is wild in the Himalayas, and west to Afghanistan. It is hardy in Massachusetts, Pennsylvania, Indiana and southward. It grows 150 ft. tall. The twigs are bloomy and smooth. The leaves are slender and drooping, with five needles to a bundle, 4 to 7 in. long, toothed, grayish or bluish-green. The cones are large and long and olive-brown in color. The Himalayan Pine should be planted so that it is not subjected to the fiercest blasts of the wind, otherwise it may burn. It transplants easily because the roots are quite fibrous. See Cedrus, page 365.

Limber Pine (American Cembrian Pine) (Squirrel Pine), *Pinus flexilis*. This species forms a narrow pyramid when young but becomes broad with age. The branches are horizontal and pendulous. It is found native from Alberta to California, west to Montana and Western Texas. It is hardy except in the extreme North. It attains a height of from 45 to 75 ft. The twigs are hairy, tough and flexible, hence the name Limber Pine. The leaves are short, 1 to 3 in. long, in bundles of five, and yellowish-green. The soil should be well drained but there should be plenty of moisture and sandy loam; although it will tolerate very poor soil. John Dunbar reported that its slow growth makes it almost a shrub at Rochester.

The commonest five-needle Pine is the blue-green White Pine

White Pine, *Pinus strobus*. The White Pine is pyramidal in form and becomes quite picturesque with age. The branches are horizontal and curved slightly upward. It is native from Newfoundland to Manitoba, and south to Georgia, Illinois and Iowa. It attains a height of 90 ft. The twigs are greenish and greenish-brown. There are five leaves in a bundle without sheaths. They are slender, soft, 2½ to 5½ in. long, toothed, and bluish-green. This species seems to like good soil. It succeeds in sand and adapts itself also to clay better than other Pines. It is susceptible to pests, especially scale and blister rust. The sawed wood is very white; thus the name White Pine. It is a timber tree and also an ornamental species. It grows rapidly when in a favorable place.

Three Needle Pines

Longleaf Pine (Southern Pine), *Pinus palustris* (*australis*). This Pine has an open head, being 120 to 150 ft. tall. It is native of Virginia to Florida and Mississippi along the coast, and it is not hardy except in North Carolina, Tennessee, Arkansas, Oklahoma and south-

The Western Yellow Pine, P. ponderosa, has rigid needles, mostly in clusters of three

ward. The bark and the twigs are orange-brown. There are three needles in a bundle, which are crowded and tufted at end of the twig; they are 8 to 18 in. long and are dark green. The cones are 10 in. long. The Longleaf Pine is important timber in the Southeastern States, producing good resin. The branches are used as decoration.

Western Yellow Pine (Bull Pine). *Pinus ponderosa.* It has spreading, stout branches, sometimes pendulous. It is found wild from British Columbia to Mexico, and east to South Dakota and Texas. It is very hardy in Rochester (N. Y.), Ohio and Kansas. It grows 150 ft. tall. The twigs are orange-brown, fragrant when broken. The bark is cinnamon-red to nearly black. There are two to five needles in a bundle, although there are usually three. They are rigid and long, 5 to 10 in., and are dark green. The Western Yellow Pine prefers well-drained, moist soil, pure clay, or even sand. It is one of the tallest Pines and is of strong growth. It is an important timber

tree of the West, and in the landscape it is used for screens and as a background.

Pitch Pine, *Pinus rigida*. It has an irregular head, with rather short, horizontal branches. The tree is 75 ft. in height. It is wild in New Brunswick to Georgia, west to Ontario and Kentucky. It is hardy except in the extreme North. The bark is red-brown. There are three to five needles in a bundle. The needles are rigid, spreading, 3 to 5¾ in. long, and are dark green. The Pitch Pine grows in pure sand and other poor soils, even though they be dry and rocky.

Two Needle Pines

Japanese Red Pine, *Pinus densiflora*. This tree has an irregular broad head, with dense, bushy, spreading branches, and is found wild in Japan. It is injured in the North in severe Winters. The trees grow 100 ft. tall and the bark is orange-red. The twigs are orange-yellow, with a gray bloom. The leaves are slender, two in a bundle, 3¼ to 4¼ in. long, and are blue-green. It makes a rapid growth when young.

Variety *umbraculifera* (*tabulaeformis*), the Japanese Umbrella Pine, has a low, round, tufted head, and it is used for formal specimens. Includes the Tanyosho, the Japanese Table Pine, which is flat on top, and Bandaisho as varieties.

Swiss Mountain Pine, *Pinus montana* (*mugho*). This is a very hardy species and is native of the mountains of China and Southern Europe. It is usually considered as a shrub but sometimes is 35 ft. tall.

There are two needles in a bundle, which are crowded, stout, 1¼ to 3¼ in. long, and bright green. It thrives in a stony and dry soil, and it does not show effects of severe cold. The Swiss Mountain Pine can be used for formal effect, or if irregular specimens are chosen, they may be delightfully picturesque. When used for formal planting these should be pruned to keep them in uniform shape. For transplanting notes, see Cedrus, page 365.

Some of the varieties are very dwarf. Some apply the name *mughus* to a dwarf variety only.

Austrian Pine, *Pinus nigra*. This tree has a flat top with age. It is native of Central and Southern Europe and Asia Minor. It is hardy except in the coldest States, and attains a height of 90 ft. There are two needles in a bundle, which are stiff, 3½ to 6½ in. long, and dark green. This species tolerates a salt spray and thrives in a moist but not too wet soil. It prefers a limestone soil. It is the variety *austriaca* which we plant most commonly.

Variety *austriaca* has an informal habit often delightfully irregular. It produces vigorous, stout, spreading branches, with long, dark

A young plant of the Swiss Mountain Pine which is usually shrubby so that it is useful for planting in small home grounds

green leaves. It is not subject to diseases and is perfectly hardy, tolerating dust and smoke better than White Pine.

The writer most easily identifies this Pine in late Winter by its long coarse leaves, which surround large buds in which the scales peel back to form an attractive rosette.

Red Pine (Norway Pine), *Pinus resinosa*. The branches are stout, sometimes pendulous. The tree has a heavy character, with a broad, rounded head. It is native from Nova Scotia to Manitoba, south to Pennsylvania, Michigan and Minnesota. It is practically hardy throughout the United States, and grows to 75 ft. high. The bark is redder than most other Pines. There are two needles in a bundle. These needles are flexible, being 5 to 6¾ in. long, and they are soft to the touch. The Red Pine can grow in clay but also in sand or gravel, and thin, rocky places. It tolerates smoke and even a slightly wet soil. In the landscape it is used for bold effects where few other Pines grow. It is often mistaken for the Austrian Pine. The common

name, Norway Pine, refers to the town of Norway near which it was found. For transplanting, see Cedrus, page 365.

Scotch Pine, *Pinus sylvestris*. In its young stage it is a pyramid but becomes irregular with age. It is picturesque but not beautiful in the same way that the White Pine is. The branches become spreading and pendulous. It is very hardy, is found native of Europe to Siberia. It grows 75 ft. tall and often lives 200 years. The twigs are dull gray-yellow. The bark is red-brown, often yellowish; few other Pines have as bright a color. The leaves are arranged two in a bundle, rigid, twisted, 1¼ to 2¾ in. long, and are blue-green. The cones are pointed backward. It makes a rapid growth, preferring acid soil or poor, sandy soil. It is used to make ship masts and general timber purposes in Europe. It is resistant to cold, drought and dry winds.

White Pine Blister Rust. In some sections of our country the blister rust has almost killed all the five-leaf Pines. This disease is found abundantly in Wisconsin, New York, Minnesota, Washington and Oregon. C. M. Scherer of the Davey Tree Expert Co. describes the disease as follows:

The organism is peculiar in that it attacks the Pine in the late Spring and early Summer, remaining in the tree for from one to four years without showing any external signs. (It was due to this latent quality of fungus that it escaped detection when imported.) It fruits on the Pine from May until July, appearing as a distinct blister, at first white or pale yellow, about half the size of a fingernail, and finally turning to an orange color. When opened the blister is found to be filled with millions of spores, which can infect plants within a radius of several hundred feet. The rust now attacks *all Currants* and *Gooseberries* and forms on them round, brown colored spots in which are produced the orange-colored Summer spores, which spread to other Ribes plants. In the Fall, dark brown, hairlike projections appear, making the leaf look as though it were covered with felt. In this hairy covering the spores live over until the following Spring, when they germinate and are ready to attack Pines again. The cycle is thus Pine to Ribes, Ribes to Ribes, Ribes to Pine. Currants and Gooseberries belong to the genus Ribes. Both hosts are necessary for this cycle to be completed. The disease cannot be transmitted direct from a diseased to a healthy Pine. It will girdle a young tree in two years; older trees will last longer but their beauty is destroyed.

As to control, eradication of one of the host plants is essential. Cultivated Ribes are just as good hosts as wild Ribes, and where one of the two hosts is important, the other should not be grown.

Propagation

Seed. Stratify the seeds in the Fall at a temperature 32 to 50 degrees for one to three months. See page 145. Sow the seed in the

Spring. Give the seedlings plenty of room, shading the early growth and spare the water.

Grafting. In grafting, use two-needle stock for two-needle Pines, five-needle stock for five-needle sorts, etc.

PODOCARPUS

(Poh-doh-kar′-pus. From Greek *podos,* foot, and *karpos,* fruit; refers to the fact that some species have fleshy fruit stalks.)

Yew Podocarpus (the Longleaf Podocarpus), *Podocarpus macrophylla* (*longifolia*), closely resembles the Yews (Taxus) though the leaves are longer and wider. This species is a native of Japan and is planted from North Carolina to Texas, and the Pacific Coast. It grows to a height of 60 ft. and forms spreading short branches. The trunk is gray, covered with shreddy bark. The foliage is long and narrow, 2 to 4 in. long, long-pointed, glossy dark green, yellow, and gray beneath. The fruit is purplish, fleshy, and globular, and it has a nutlike seed. The Podocarpus is grown as a pot plant in the Northern States.

Japanese Podocarpus, *Podocarpus nagi* has leaves which are elliptical rather than long-narrow. They are ¾ in. across and 2 to 3 in. long. They are native of Southern Japan and are grown in Southern California and Florida.

Propagation. See Taxus, page 406.

PSEUDOLARIX—Goldenlarch

(Seu-doh-lair′-ix. From *pseudos,* false, and *Larix,* larch. It was discovered by Robert Fortune.)

The Goldenlarch is so similar to the Larch that even some horticulturists call it a species of Larch. It differs from the Larch in technical characteristics; namely, a Larch has blunt bud scales, the male flowers are solitary, the cones are globular, and their scales are persistent.

The Pseudolarix has pointed bud scales and clustered male flowers; the cones are not so globular and the cone scales are shed when the cone is ripe. Added to this, the leaves are wider than Larches.

These are deciduous trees, with whorled branches, which form a broad pyramid, due to the fact that the lower branches are stout and horizontal, and the upper are ascending.

Goldenlarch (Chinese False-larch), *Pseudolarix amabilis* (*kaempferi*). It is native of Eastern China and is quite hardy in Massachusetts, Ohio, Missouri and southward. It attains a height of 120 ft. The twigs are yellowish-brown and the bark is reddish-brown and

breaks into narrow scales. The leaves are deciduous, linear, and are $1\frac{1}{4}$ to $2\frac{3}{4}$ in. long. They are wider than those of the various Larches and are soft. They are light green and turn yellow in the Fall. The cone scales drop soon after the cones ripen. The Goldenlarch dislikes limestone and prefers a light, sandy, sunny, open place.

PROPAGATION

Seeds. Sow the seeds in Spring.

Grafting. "Horticulture" notes that grafted plants make poor growth. The Larix is used as a stock and grafting may be done in the Spring.

PSEUDOTSUGA—Douglas-fir

(Seu-doh-seu-ga. From *pseudos*, false, and *Tsuga*, hemlock.)

The graceful form and the rather horizontal branches which curve down and then gracefully ascend at the tip, places the Douglas-fir as one of the most attractive specimen trees for home planting. It is hardy except in the extreme North, but there are two forms of this tree. The one from the central regions of the United States, especially from Colorado, is hardier than those native on the Pacific Coast.

Note the strange cones of the Douglas-fir which have appendages on each scale—(From U. S. D. A. Bulletin 680)

Douglas-fir (Douglas-spruce) (Redfir) (False-hemlock), *Pseudotsuga douglasi* (*taxifolia*) (*mucronata*). In the wild this tree becomes 300 ft. high, but it is usually less in cultivation. It is native of British Columbia to California, Montana, Colorado, New Mexico and Western Texas. The twigs are hairy, pale orange at first, but changing red-brown, and later gray-brown. The buds are oval, sharp pointed, smooth, and not resinous. The bark is smooth, thick and corky on old trees. The leaves are straight, $\frac{3}{4}$ to $1\frac{1}{8}$ in. long, dark or bluish-green, with two gray bands beneath. They are spirally arranged but form a flat spray. The cones are 2 to 4 in. long, with long appendages, three-lobed at the tips. The Douglas-fir grows even

in dry soils but it prefers moist soil, though it must be perfectly drained. It transplants easily. Sometimes the tips freeze in which case they should be sheared off. It often needs to be encouraged to form leaders when young. It grows about 1 ft. per year and appreciates shade. It is an exceedingly good tree for home grounds as it stands adversity.

Variety *glauca*, Blue Douglas-fir, is the Rocky Mountain form. It makes a slower growth, is more compact and has shorter leaves which are bluer-green and less hardy.

PROPAGATION. Seeds. Grow readily from Spring sown seed.

SCIADOPITYS—Umbrella-pine

(Sy-a-dop′-i-tis. From Greek *skias,* or *skiodos,* an umbrella.)

The Umbrella-pine, *Sciadopitys verticillata*, superficially resembles a Pine. It grows to be 120 ft. tall, is native of Central Japan, and is hardy in all except the coldest States, growing particularly well in Massachusetts. It has slender branches which ascend at the ends to form a narrow, symmetrical pyramid. The bark is quite smooth, peeling in long shreds. There are two kinds of leaves. The small and the scalelike leaves on the twigs are not recognized as such; the others are in umbrella-like whorls of twenty to thirty, and they are flat and grooved on each side. It produces oval cones. The Umbrella-pine must grow in deep, moist, well drained soil. Avoid dry, hot situations.

PROPAGATION

Seeds. They grow slowly from seed, which should be sown in Spring.

Cuttings. Trees reared from cuttings are said to be unsymmetrical.

Grafting. See page 159.

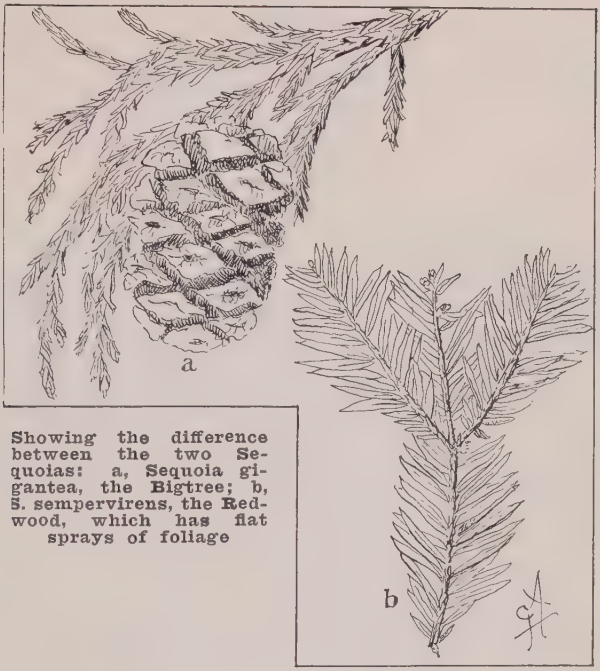
SEQUOIA (Wellingtonia) Redwood (Bigtree)

(See-quoi′-a. Named after Sequoiah, inventor of the Cherokee alphabet.)

The Redwoods and the Bigtrees of California, of course, are our choicest American sylvan heritages. They are not found wild in any other country of the world.

Giant Sequoia (Bigtree), *Sequoia gigantea* (*washingtoniana*). When young this tree is pyramidal. It is native of California and the west slopes of the Sierra Nevada Mountains. It is hardier than the Bigtree and grows 300 ft. tall, often 90 ft. in circumference. The base is buttressed. The bark is often 1 to 2 ft. thick. The twigs are not flat but the leaves are spirally arranged, sharp pointed, more or less

An unusually good specimen of the Umbrella-pine showing the characteristic umbrella-like whorls of leaves



Showing the difference between the two Sequoias: a, Sequoia gigantea, the Bigtree; b, S. sempervirens, the Redwood, which has flat sprays of foliage

appressed, ovate-lanceolate, and ⅛ to ¼ in. long. It makes a rapid growth when young. See Cedrus, page 365, for transplanting notes.

Redwood, *Sequoia sempervirens*. When the Redwoods are young they are pyramidal with horizontal branches. They are native of California and Southern Oregon, near the coast. Several Redwoods growing in Rochester, New York, were sixty years old before being killed by the cold, but they are best grown from North Carolina and Tennessee southward, and the Pacific Coast. They are 300 ft. tall and sometimes 75 ft. in circumference. The bark is red-brown, often 8 to 12 in. thick. The leaves form flat sprays but they are of two kinds. On lateral twigs they are two-ranked, sharp pointed, dark green and grooved above, with two whitish bands below. Those on the leading shoots are appressed, spreading, spirally arranged, with an incurved callous point, ½ to ¾ in. long. The Redwood produces oval cones with woody scales. It is found in moist, cool climates, and is straggling in dry climates. It suckers freely when cut

down. The growths on the trunks are known as Redwood burls and are sold by florists to be placed in a bowl of water. They sprout beautifully and are useful for table decoration.

PROPAGATION: Seed. Sow the seeds in Spring.

HOW THE SEQUOIAS DIFFER*

Of the two species of Sequoia, *S. sempervirens* is the Coast Redwood of California, and except for a trifling incursion into Oregon, grows in the coast range only, down to Monterey and always within the area of the Pacific fogs. The other, *S. gigantea*, commonly known in America as the Bigtree, and here as Wellingtonia in pious memory of the Iron Duke, occurs only on the western flanks of the Sierra Nevada from the American River on the north, southwards to Deer Creek. Not only are the trees different in their natural distribution, but they are distinct in appearance, and in the way they reproduce themselves. The Coast Redwood is the taller of the two, and the more slender, if the word may be used of a tree round the trunk of which eight men with outstretched arms could just join hands—an operation that would take them barely half round the base of some of the Bigtrees like the monster called after General Sherman, which is 37 ft. in diameter at the base! The graceful foliage of the Coast Redwood recalls that of the Hemlock, while the prickly leaves of the Bigtrees are unlike those of any other conifer except the Japanese Cryptomeria.

In the way they reproduce themselves the trees are different, too, for while the Coast Redwood sprouts from the stump when it is felled, the Bigtree grows from seeds. The stools of the former will sprout even in the dense shade of the groves where little else but Oxalis will grow, but seeds of the Bigtree do not germinate in the darkness of a grove, nor will seedlings grow there. A curious thing about the Bigtree is that although, with the exception of some of the Australian Eucalyptus, it is the tallest tree in the world, the seed from which it springs is neither so long nor so large as an ordinary phonograph needle.

The trees bear their flowers in February, before the snows have melted, and the male and female blossoms jostle each other so thickly on the fingerlike foliage that the pollen of the male flowers throws a golden veil over the trees, even covering the snowy carpet beneath them with a dust of gold. When the flowers wither the cones are born as tiny, pearly-gray grains of Wheat, and by the end of the Summer, when they have taken definite shape, they are almost a third of their ultimate size and a brilliant grass-green color.

Records made by the National Park Service† from 1906 to 1919

*Quoted from article by A. Grove in *Gardeners' Chronicle* (England) July 4, 1931.

†*Big Trees*, by Walter Fry, U. S. Commissioner, Sequoia National Park, and J. R. White, Superintendent, Sequoia National Park. Stanford University Press, Stanford University, California, 1930.

showed that of twelve cones kept under observation as they hung to the trees, eight clung on for ten years and one for thirteen years, while none was entirely empty when it fell. Rain falling on the cones when they begin to open will cause them to swell, keeping the remaining seeds imprisoned until the succeeding season, so years may pass before a cone is empty. This peculiar characteristic is of unusual interest from the standpoint of propagation.

The Redwoods of California among which there are trees old enough to have witnessed most of the important history in the world—(Photo by A. Gaskill—Courtesy U. S. Forest Service)

The shedding of the seeds of a Bigtree grove is a wonderful sight, for they are as light as a feather, and every rustle of the October wind lets loose a cloud of seeds which float on the breeze, dancing here and there in the sunlight like golden insects until they fall, may be, hundreds of feet away. The prodigal waste of it all is astonishing, for, of the millions of seeds which fall, only comparatively few survive all the perils to which they are subjected, and grow into trees.

For some years the Save-the-Redwoods League has attempted to interest the whole of the United States in the preservation of these Bigtrees and Redwoods. All Americans who visit these groves of the Sierras or travel the Redwood Highway in California are deeply impressed with these sacred heritages.

The novelist, Joseph Hergesheimer, went to the Redwood district several years ago with the preconceived notion that it was only idle sentiment on the part of those who wished to preserve these trees. However, later he wrote an article in *The Saturday Evening Post* in which he said:

I lost for the moment my interest in economic lumbering, in utilization and variety of manufacture; I forgot who legally, rightfully owned that stand, any stand of Coast Redwood trees. Then I remembered how rich as a nation we were, the only rich country left after the late disasters of modern civilization. Yet we hadn't enough gold, with all our gold—we hadn't the integrity, with all our show of public faith—to keep three or four hundred thousand acres of a natural magnificence needed more for the integrity of our fiber, the sheer future survival of spirit than for surpluses of employment, of temporary gangs, crews of labor, and invested securities. Standing in a grove, I thought of the bitter and vain resentment that the future—when it had learned that a commerce was not enough to keep the heart alive—would hold against the past, our present. The grace of the towering trees masked their gigantic span; the ground, in perpetual shadow, held only flowering Oxalis in emerald ferns. It was raining softly. The fallen trunks of an utter remoteness, too great to see over, were green with moss. The whisper of the wind was barely audible, far off, reflective; the gloom in the trees was clear, wet and mild. It was the past. And this was the Redwood's secret, their special magic, that they absolved, blotted out the fever of time, the wasted years, the sickness of mind, in which men spent the loneliness of their life.

History of Sequoias *

Who first discovered the Bigtrees is not known, and precise records are nebulous until 1852, when one Dowd, a miner, pursuing the trail of a wounded bear in the mountains of Calaveras County, came on the largest trees on earth, in what is now known as the Calaveras North Grove. At that time the Redwoods of the Coast range

* Quoting from A. Grove again.

were already well known, and as the pick of these are nearly three times the height of the Nelson column, and as large in diameter at the base as a Rolls Royce car is long, stories of trees with trunks nearly twice the diameter of the others were at first scoffed at as travelers' tales. The facts were soon verified, however, and then, gradually, more and more Bigtrees were discovered.

In 1857, the Mariposa Grove, now part of the Yosemite National Park was found, and a year later a stockman, Tharp, found the famous Muir Woods and then Giant Forest, each of them subsequently included in the Sequoia National Park.

In the hollow base of a fallen Sequoia, Tharp made for himself an unique cabin, 56 ft. long and 8 ft. high, and it is still there. Tharp had been guided to the Giant Forest by friendly Indians, and his discovery was soon followed by others. The process has continued until every grove is probably known to the National Forestry Service, although there are remote groves that are known only to them and a few others. Many of these groves are of virgin timber, others have been partly destroyed; a few, like the forest of Converse Basin, have been almost entirely cut down, butchered for nothing, since only a fraction of the wood has ever been used, partly because the felled trees lay awkwardly or were too large to handle.

Their Age

The age of the Bigtree is problematical and the age limit unknown, because arboricultural authorities have no record of a tree dying of old age. The chances are overwhelming that a Bigtree will be destroyed or seriously mained by fire, lightning, wind, landside or erosion, before it reaches maturity. For that reason there is, probably, no perfect Sequoia of great age in California, for none of them reaches what may be called the giant class before it is at least one thousand years old. Statements as to the age of famous individual trees, like the Grizzly Giant, General Sherman, or General Grant, are conjectural, and their age can only be assumed by comparison with lesser giants which have been felled. Even the record of the rings may be suspect, for, if Sir Joseph Hooker was right, the trees may make more than one ring of growth annually. The variation in the ring growth, too, is puzzling, for on the same trunk there may be one hundred rings crowded in the space of an inch in one part, and rings as much as a quarter of an inch each wide in others.

Of nearly 2000 fallen trees of which Judge Fry has measured the rings in the past forty years, he found that two were over 3000 years, and fifty-four more than 2500 years old; these ancients made their greatest growth between 700 B. C. and 650 B. C., as well as between 450 B. C. and 250 B. C., while there were two periods of abnormally small growth, between A. D. 650 and A. D. 750, and again between A. D. 1450 and 1500.

Bigtrees are extraordinarily resistant to forest fires that burn up huge Pines and Firs like kindling but are helpless against lightning.

TAXODIUM—Baldcypress

(Tax-oh'-di-um. Greek for *similar to Taxus.*)

Baldcypress is known to travelers to the South, and it is a native from Delaware to Florida, west and south to Illinois, Missouri, Arkansas and Louisiana. It is particularly noted because it grows in swamps and produces what are known as Cypress knees, which are modified roots growing out of water, often 5 ft. high. This is the method of the tree to obtain the requisite amount of air for its roots when growing in water. The Southern Negroes use these hollow Cypress knees as beehives. Professor Wilson, of the University of Pennsylvania, believes that these are formed as a result of roots which come to the surface of the water and then turn back to the soil. It is the roots bending back to the soil that form the knees.

Baldcypress, *Taxodium distichum.* The trunk of the Baldcypress tapers and is strongly buttressed at the base. It is hardy north of its habitat. It grows to a height of 150 ft. The twigs are green, becoming brown, and the bark is furrowed and scaly. The leaves are deciduous, alternate, flat, and in flat sprays. They are soft, bright, light green, yellowish or whitish beneath, and they turn orange-brown before falling. The Baldcypress thrives in moist, well drained soil, but is found native in swamps. It grows rapidly. The wood is used to make shingles, for greenhouse construction and other uses where wood must withstand warm, moist conditions.

PROPAGATION

Seeds. Stratify the seeds for a month at 32 to 50 degrees. See page 139. Sow them in Spring.

Cuttings. Meehan advises that the cuttings be rooted in sand and water.

Grafting. Veneer graft in the greenhouse in late Summer.

TAXUS—Yew

(Tax'-us. Ancient name.)

Most of the Yews are not treelike, and there are very few places in the United States where the Yew would be considered as a tree.

In many ways the Yew and the Hemlock are quite similar, but the twigs of the Yew are usually the same color as the foliage. In other words, they are green or bronzy green, whereas the Hemlocks have brown twigs, and there are two distinct white lines on the lower surface of each leaf.

The bark is reddish-brown. The twigs are alternate. The leaves are spirally arranged but form a flat spray. Sometimes the leaves have curved tips (falcate) and gray or yellow bands beneath. The fruit is a bell-shaped, translucent red berry with one seed.

The plants must be clipped to keep them compact and symmetrical if this is a desired characteristic. The Yews are poisonous to cattle and horses. For transplanting, see Cedrus, page 365.

The treelike form of the Japanese Yew is known as capitata

SPECIES

The species differ but slightly in botanical characteristics:

Taxus baccata. Scales of Winter buds blunt, not keeled. The leaves are gradually pointed.

Taxus cuspidata. Scales of Winter buds sharp pointed, keeled. The leaves are abruptly pointed.

English Yew, *Taxus baccata.* The Yew has been cultivated since ancient times. It forms a broad, round head. It is hardy in West Virginia, Kentucky and Oklahoma, and it is a native of Europe, Northern Africa and Western Asia. It is considered not as hardy as the Japanese Yew. It grows 60 ft. high. The twigs are green. The leaves are abruptly narrowed into a very short, green petiole, ½ to 1 in. long, dark green and lustrous above, with two pale green bands below. The tips are gradually pointed. This species burns in cold, sunny Winters. It must be planted in protected places only.

The Irish Yew, variety *fastigiata* (*hibernica*), is columnar, with crowded, upright branches. The leaves are spiral, unlike the type, and are dark green.

Japanese Yew, *Taxus cuspidata.* The Japanese Yew has an upright, spreading habit. Dunbar calls it "the most important foreign evergreen ever introduced to this country." It is perfectly hardy except farthest North. It was found in Japan, Korea and Manchuria. It is only 50 ft. tall. The mature twigs are reddish-brown. The bark is reddish brown also. The leaves are irregularly two-ranked, forming a V-shaped trough. They are abruptly contracted into a yellowish stalk. They are a dark dull green, with two yellow bands below. The tips are abruptly pointed. The Japanese Yew cannot tolerate drought when young. It is best on rocky or shaley soil. It remains a good green color through the Winter.

VARIETIES. Some of the varieties are treelike, others are spreading shrubs. Nurserymen list the variety *capitata*, but this name is only used to distinguish this upright form of the species from the low sorts.

Taxus media is a hybrid between *T. baccata* and *T. cuspidata.* It forms a broad pyramid. It is vigorous. The twigs are olive-green, with slightly keeled Winter buds. It has broader leaves than *T. baccata* and more abruptly pointed leaves. It was produced by T. D. Hatfield.

Variety *hicksi.* This is one of the *T. media* varieties, with a narrow columnal form. It is hardier than the Irish Yew and is a slow grower.

Variety *hatfieldi.* This is a compact cone with upright, ascending branches and dense habit.

Chinese Yew, *Taxus cuspidata chinensis.* The Chinese Yew, of course, is a native of China, the central and western portions. It is hardier than the English Yew. It is 35 ft. tall. The mature twigs are yellowish-green. The leaves are in flat sprays, with the leaves far apart. They are at right angles to the stem, usually with a curved tip (falcate), 1 to 1½ in. long, dark green, with a raised midrib, and grayish beneath. Unlike the *Taxus baccata,* the leaves are abruptly pointed.

PROPAGATION

Seed. Free the seeds from the pulp and store them in damp peat moss or sand. Plant them in Spring or sow them in greenhouses in Winter.

Cuttings. It takes a year to root the cuttings. Peat moss or a mixture of peat moss and sand is the best medium for rooting.

THUJA—Arborvitae

(Theu'-ja or theu'-ya. Ancient Greek name from *thyon,* sacrifice; the resin from an Eastern variety used instead of incense. No author explains why it was called Arborvitae (the tree of life.)

A branchlet of Arborvitae. Note the prominent gland.

The Arborvitaes form a very distinct group of evergreens, with erect branches and sprays of flattened, scale-like foliage, which is very closely packed together, so that it is not considered to be foliage by the casual observer. The lateral leaves nearly cover the ones on the face of the branch. The cones have eight to twelve scales.

Arborvitaes tolerate but little shade. They often turn brown in Winter. They are extremely susceptible to red spider when planted in too dry situations.

American Arborvitae, *Thuja occidentalis.* The American Arborvitae is 60 ft. tall, but we generally do not consider it to be a tree. It has a pyramidal head and there are 50 varieties in cultivation. It is hardy in all the Northern States. It is a native of Nova Scotia to Manitoba, south to North Carolina, Tennessee and Illinois. The trunk is stout and buttressed. The leaves are abruptly pointed. Those on the main axis have a prominent gland. They have a pleasing odor. It thrives in soil too wet for most evergreens. It is used for specimens and hedges.

One of the best varieties of the common American Arborvitae is known as robusta. It forms a dense pyramid

Variety *robusta* (*wareana*) (*sibirica*). This is a denser form than the type, with pyramidal shape. The twigs are stouter, bright green, and it is grown from cuttings. Often cataloged as Siberian Arborvitae.

Variety *riversi*. A pyramidal form with yellow-green leaves.

Variety *rosenthali*. A columnar form, with lustrous dark green leaves.

Variety *fastigiata* (*pyramidalis*) (*stricta*). A columnar form, with short branches.

Variety *vervaeneana*. A pyramidal form, with slender twigs. The foliage is a trifle yellow.

Variety *douglasi pyramidalis.* Forms a narrow pyramid, with short, crowded sprays. It is of slow growth.

Variety Columbia. A slivery sort, but too gray in appearance.

Oriental Arborvitae, *Thuja (Biota) orientalis.* This is a pyramid or bushy tree, native of Northern and Western China and Korea. It is hardy in Pennsylvania, Ohio, Illinois, Missouri and southward. The twigs are slender, generally standing straight up as compared with American Arborvitae, in which the twigs are rather irregularly arranged. The trunk branches near the base, and the bark is thin, papery and reddish-brown. The leaves are bright green, nearly alike on both sides.

Variety *elegantissima.* A compact pyramid, bright yellow in the Spring and yellow green in the Summer.

Note that the sprays of foliage in the Oriental Arborvitae, commonly called Biota, are vertical and placed like cards in a filing cabinet

Variety *conspicua*. A compact column. It is golden yellow, suffused with green.

Note the cones of the Giant Arborvitae which have scales arranged like the shingles on a roof. Compare these cones with those of Chamaecyparis (page 368)—(From U. S. D. A. Bulletin 680)

Giant Arborvitae (Canoe-cedar) *Thuja plicata* (*gigantea*) (*lobbi*). This species is thinner in habit than the others, with a pyramidal form and short branches, pendulous at tips. It is as hardy as the Oriental Arborvitae. It is native of Alaska, Northern California, and Montana. It attains a height of 180 ft., though usually 30 ft. at Rochester, New York. The trunk is buttressed and the bark is cinnamon-red. The leaves are bright green, glossy above, with whitish marks below. The Giant Arborvitae is of rapid growth, preferring moist but well drained soil. Prefers acid sand for rooting cuttings.

PROPAGATION

Seed. Gather the seed and stratify it for Winter at a temperature of 32 to 41 degrees for sixty days. See page 139. Sow the seeds in Spring.

Cuttings. Easier to root than most evergreens. Insert in Summer or Winter in sand or sand and peat moss.

Grafting. *Thuja orientalis* is a particularly good stock. See veneer grafting, page 159.

THUJOPSIS—False-arborvitae (Hiba-arborvitae)

(Theu-yop′-sis. From *Thuja* and the Greek *opsis*, like.)

As the name indicates, False-arborvitae closely resembles the True Arborvitae. It forms a pyramid with spreading branches, which are irregularly whorled.

Thujopsis dolabrata is native of Central Japan. It is hardy in Maryland, West Virginia, Kentucky, Oklahoma and southward, also on the Pacific Coast. It is 45 ft. tall. Leaves are opposite; lateral ones are hatchet-shaped, rather pointed, and facial ones ovate-oblong, blunt, glossy dark green, with white patches below. It makes a slow growth and is not good in dry climates, preferring a moist, sandy loam.

Variety *hondai* may be hardier in Eastern States than the type. Twigs are more closely set, partly overlapping. Leaves are smaller.

PROPAGATION. See Thuja.

TORREYA

(Tor-ree'-a. Named for John Torrey, American botanist, 1796-1875.)

The spreading, somewhat pendulous branches of the Torreya so closely resemble the Yews that they are often confused with these commoner plants. For transplanting, see Cedrus, page 365.

Florida Torreya (Stinking-cedar), *Torreya taxifolia.* This species has a spreading, somewhat pendulous, open and erect head. It is hardy in Rochester, New York, though found native in Florida. The tree is 45 ft. tall. The twigs are almost opposite. The two-year twigs are yellowish-green. The leaves are linear, spiny pointed, in a flat plane, lustrous, with two narrow white or brown lines beneath. They are 1 to 1¼ in. long, and when crushed are bad in odor. Avoid placing the Florida Torreya in a place which is too open and windy.

California-nutmeg, *Torreya californica.* This is of spreading habit, being a trifle pendant. In old age it has a rounded top. In California, where it is a native, it grows 60 ft. tall, but it is usually not treelike in the colder regions. It is especially hardy as far north as Philadelphia, Tennessee, Oklahoma, Arkansas and southward. The bark is gray brown. The two-year-old twigs are red-brown. The foliage is spiny-pointed, slightly sickle shaped, like that of the Yew but longer. The seeds are somewhat like nutmeg in appearance. When cut down the California-nutmeg sprouts from the stump.

Japanese Torreya, *Torreya nucifera.* This has wide spreading branches, with an oval head. It is a native of Japan and is hardy in Massachusetts. It is 25 to 75 ft. tall. The bark is gray-brown. The two-year twigs are red-brown. The leaves are abuptly narrowed at the base and are spiny-pointed. The fruit is a faint purple, with edible seeds. The wood is used in Japan for cabinet work and water buckets.

PROPAGATION. Seeds. Stratify the seeds for Winter or sow the seeds in Winter in the greenhouse.

TSUGA—Hemlock (Hemlock-spruce)

(Seu'-ga. Japanese name.)

The leaves of the Hemlock have two white lines on the lower surface

The lacy, airy gracefulness of the Hemlock is known to most persons living in the United States because they are common trees in the hills and mountains.

Hemlocks, unlike Yews, have two white lines on the lower side of the leaves and brownish, not greenish, young twigs.

SPECIES

Canada Hemlock (Hemlock-spruce) (Common Hemlock), *Tsuga canadensis.* This has long, slender, often pendulous branches, with pyramidal head. It keeps its branches to the soil. It is 90 ft. tall and is native of Nova Scotia to Minnesota and Illinois, South on the mountains to Northern Georgia and Northern Alabama. It is hardy in all places except the farthest North. The twigs are yellow-brown, slightly hairy, with prominent leaf cushions. The leaves are ¼ to ¾ in. long, with rounded tips, dark green, slightly toothed at the apex, with white lines beneath. The tree prefers a well drained, rich soil, It burns easily when in cold, exposed places where foliage dries out in Winter. It is a handsome ornamental and timber tree, and is used for hedges in shaded and sunny places.

This tree is considered difficult to transplant. If moved from woods, only 4 to 6 in. plants should be collected. See transplanting Cedrus, page 365.

Carolina Hemlock, *Tsuga caroliniana.* This is a rather pendulous species and is more handsome than the Canada Hemlock. It is a native of the mountains of Southern West Virginia to Georgia. It grows 75 ft. tall. The twigs are orange-brown, and they are a trifle hairy. The buds are hairy and blunt. The leaves are dark green above, with notched tips, and have white bands beneath. The cones are larger than those of the Canada Hemlock and are quite ornamental. The Carolina Hemlock needs abundant moisture in the soil, but it must be well drained. It is more compact and handsomer than the Common Hemlock because it has better color under similar conditions.

Japanese Hemlock, *Tsuga diversifolia.* The Japanese Hemlock has horizontal branches which form a pyramidal head. It has several

trunks. Native of Japan, it is hardier than *Tsuga sieboldi*. It sometimes attains a height of 80 ft., although it is generally less. The twigs are hairy and reddish-brown. The leaves are crowded, ¼ to ⅝ in. long, notched at the tip, glossy dark green, with white bands beneath which give interesting contrast. It is particularly useful in the Eastern States.

Siebold Hemlock, *Tsuga sieboldi*. This is a compact species, with horizontal branches forming an oval head. It is generally small but sometimes attains a height of 90 ft. Native of Japan, it is less hardy than the others and not hardy in coldest States. The twigs are smooth, not hairy, and grayish- or yellowish-brown. The leaves are linear, ½ to 1 in. long, notched at the tip, glossy dark green, with two white bands below. The fruit is oval. This species is slow of growth.

PROPAGATION

Seeds. The seeds are tiny and should be stored dry until Spring.

Grafting. Unusual forms are often grafted on the species.

The slow growing Siebold Hemlock is extremely compact and grows into a handsome specimen

Chapter XXVIII

TABLE OF TREES

DECIDUOUS TREES

O—Indicates flowers or fruits are unimportant

Scientific Name	Common Name	Height in feet	Shape	Soil	Color of flowers	Fruit	Remarks
Acer campestre	Hedge Maple	30	Round	Ordinary	Greenish	Winged	Somewhat shrubby
circinatum	Vine M.	36	Round	Ordinary	White and purple	Red	Grown on Pacific Coast
dasycarpum	Silver M.	120	Oval	Moist	Greenish	Winged	Softwood, easily broken
ginnala	Amur M.	25	Bushy	Ordinary	Green	Green	Turns red in Fall. Shrubby
griseum	Paperbark M.	25	Bushy	Ordinary	Green	Wings at right angles	3-parted leaves
macrophyllum	Oregon M.	90	Round	Ordinary	Green	Winged	Largest leaf Maple
negundo	Boxelder	60	Broad	Drouth resistant	Green	Winged	Branches easily broken. Rapid growth
nigrum	Black M.	120	Oval	Ordinary	Green	Winged	Resembles Sugar Maple
pennsylvanicum	Striped M.	36	Dense	Partial shade	Yellow	Winged	Striped bark
platanoides	Norway M.	90	Round	Even in poor	Yellow	Winged	Dense shade
pseudoplatanus	Sycamore M.	90	Round	Tolerant	Yellow	Winged	Street tree
rubrum	Red M.	120	Oval	Moist	Red	Red	Light bark at top of tree
rufinerve		40	Shrubby	Ordinary	.....	Winged	Bark striped
saccharum	Sugar M.	120	Dense oval	Tolerant	Greenish	Winged	City tree but too often used
spicatum	Mountain M.	35	Shrubby	Loamy, acid	Green	Red	Good for moist hillside
tataricum	Tatarian M.	25	Bushy	Ordinary	Green	Salmon	Turns scarlet in Fall
Aesculus carnea	Red Horsechestnut	45-75	Round	Cool	Red	Leathery	A hybrid of great beauty
glabra	Ohio Buckeye	30	Broad	Tolerant	Greenish	Leathery, prickly	Not particularly ornamental
hippocastanum	Horsechestnut	75	Oval	Tolerant	White	Leathery, prickly	Mussy street tree
octandra	Yellow Buckeye	60-90	Oval	Rich	Yellow	Smooth	
Ailanthus glandulosa	Tree-of-heaven	60	Flat top	Tolerant	Green	Winged	Survives in most adverse conditions
Albizzia julibrissin		36	Broad	Heavy	Pink	.....	Tender South of Washington, D. C.
Amelanchier canadensis	Shadblow	20	Horizontal	Lime	White	Purple berry	Early flowering, shrubby
Aralia spinosa	Devils-walkingstick	30	Broad	Tolerant	White	Black berry	Spiny
Arbutus menziesi	Madrone	50-100	Informal	Well-drained	White	Red	Smooth, chocolate bark
Betula alba	European Weeping Birch	60	Weeping	Light	O	O	White bark
lenta	Sweet B.	75	Rounded	Rich, dry, acid	O	O	Cherrylike bark
lutea	Yellow B.	90	Oval	Moist	O	O	Warm regions unfavorable
nigra	River B.	90	Oval	Moist	O	O	Ragged bark
papyrifera	Canoe B.	90	Oval	Light	O	O	Bark papery, peeling
populifolia	Gray B.	30	Shrubby	Poor	O	O	White bark
Broussonetia papyrifera	Paper-mulberry	50	Irregular	Ordinary	O	Red dehy	Sometimes used as street tree
Bumelia lanuginosa	False-buckthorn	24	Rounded	Dry	White	Black berry	Little ornamental value
Camellia japonica	Camellia	20	Shrubby	Sandy	Various	O	A shrub

Scientific Name	Common Name	Height in feet	Shape	Soil	Color of flowers	Fruit	Remarks
Caragana arborescens,	Pea-shrub	20	Shrubby	Tolerant	Yellow	. .	Shrubby
Carpinus betulus,	European Hornbeam	60	Shrubby	Tolerant	O	Green	Good for hedges
carolinana,	American H.	36	Shrubby	Swamps	O	Green	Smooth bark
Carya (See Hicoria)							
Castanea dentata,	Chestnut	90	Oval	Warm	White	Very prickly	Subject to blight
crenata,	Japanese C.	30	Oval	Warm	White	Very prickly	Small tree
sativa,	Spanish C.	100	Rounded	Porous	White	Very prickly	Popular nut tree
Casuarina cunninghamiana,	Beefwood.	70	Informal	Sand	O	. . . . .	Succeeds in alkali
equisetifolia,	Horsetail-tree	70	Informal	Sand	. . . . .	Cone-like	Succeeds in alkali
Catalpa bignonioides,	Common Catalpa	45–60	Broad	Moist	White	Long, pencil-like	Large leaves, showy large clusters of flowers
kaempferi,	Japanese C.	20–30	Broad	Good	Cream	Long, pencil-like	
speciosa,	Western C.	90	Broad	Good	White	Long, pencil-like	
Cedrela sinensis,	Chinese Cedrela	45	Broad	Loam	White	. . . . .	Resembles Ailanthus
Celtis mississippiensis,	Sugarberry	90	Oval	Tolerant	O	Orange	Street tree in South
occidentalis,	Hackberry	120	Oval	Rich, moist	O	Orange	The Northern species
Ceratonia siliqua,	Carob	40	Oval	Well-drained	Red	Large	The Locust and Wild Honey of the Bible
Cercidiphyllum japonicum,	Katsura-tree	20–100	Oval	Deep rich	O	O	Shrubby
Cercis canadensis,	Redbud	36	Flat tops	Rich	Purple	Pea-like	Early flowering
chinensis,	Chinese R.	45	Shrubby	Rich	Purple	Pea-like	
siliquastrum,	True Judas tree	30	Shrubby	Moist	Purple	Pea-like	
Chionanthus retusa,	Chinese Fringetree	10	Shrubby	Sandy	Greenish	Purple	Better than next
virginica,	Fringetree	10–30	Shrubby	Sandy	Greenish	Purple	Showy, prolific of bloom
Cinnamomum camphora,	Camphor-tree	40	Oval	Sandy loam	Yellow	Berry	Fragrant foliage
zeylanicum,	Cinnamon	30	Oval	Sandy loam	Yellow	Berry	Grown for cinnamon bark
Cladrastis lutea,	Yellow-wood	45	Round	Deep, rich	White	Pea-like	Good specimen
Cornus alternifolia,	Pagoda Dogwood	20–30	Branches in tiers	Damp	White	Blue black	Unusual habit, alternate leaves
controversa,	Giant D.	60		Tolerant	White	Blue black	Popular in West
florida,	Flowering D.	15–30	Low head	Moist	White	Red	Lovely small flowering tree
kousa,	Kousa D.	20	Low head	Shade tolerant	White	Red	Flowers with leaves
mas,	Cornelian-cherry	20	Shrubby	Tolerant	Yellow	Red	Tolerates shade
nuttalli,	Pacific D.	75	. . . . .	. . . . .	White	Red	Western form of Flowering Dogwood
officinalis		35	Erect	Tolerant	Yellow	Red	Resembles Cornus mas
Crataegus cordata,	Washington Hawthorn	30	Horizontal	Ordinary	White	Red	Good fruit
crus-galli,	Cockspur Thorn	36	Horizontal	Sandy	White	Red	Good hedge
lavallei		21	Spreading	Ordinary	White	Red	
mollis,	Downy H.	30	Spreading	Ordinary	White	Red	State flower of Missouri
monogyna,	English H.	30	Less spreading	Ordinary	White	Red	
nitida,	Glossy H.	30	Unsymmetrical	Ordinary	White	Dull red	Glossy leaves
oxyacantha,	English H.	15	Upright	Ordinary	White, red	Red	Hedges
punctata,	Dotted H.	30	Horizontal	Ordinary	White	Red	
Davidia involucrata,	Dovetree	60	Upright	Loam	White	Green	Resembles a Linden in appearance

Diospyros virginiana, Persimmon	45–60	Rounded	Sandy	White	Yellow	Astringent fruit until frozen
kaki, Japanese P.	40	.....	.....	White	Orange, red	A fruit for Florida
Ehretia thrysiflora, Tallow-tree	12–45	Spreading	.....	White	Gray	The fruits are covered with tallowlike coat
Elaeagnus angustifolia, Russian-olive	20	Irregular	Tolerant	White	Yellow	Gray leaves
Eucalyptus amygdalina angustifolia, Peppermint Gum	325	Upright	Tolerant	White		Tallest trees in Nature
caesia, Gungurru	20	Pendulous	Alkaline	Salmon-pink		Exquisite flowers
calophylla, Port Gregory Gum	60	.....	Tolerant	White, pink		
erythrocorys, Illyarie	30	Upright	Tolerant	Yellow		Brilliant red caps on buds
ficifolia, Scarlet Gum	30	.....	Tolerant	Red, pink, orange		Showy flowers
globulus, Blue Gum	300	Upright	Tolerant	White	Bony capsule	Important species with gray leaves
hemiphloia, Australian Graybox	90	.....	Tolerant	.....		
maculata citriodora, Lemon Gum	150	.....	Tolerant	Cream		Lemon-scented leaves
polyanthemos, Redbox	150	.....	Tolerant	.....		Bluish green leaves
robusta, Brown Gum	100	Upright	Tolerant	Cream		Rough persistent bark
rostrata, Creek Gum	200	.....	Tolerant	.....		Shade tree
sideroxylon rosea, Mulga	50	Pendulous	Tolerant	Rose	.....	Handsome, drooping clusters
torquata, Coralgum	12	Upright	Tolerant	Red-orange	.....	Exquisite buds
viminalis, Manna Gum	300	Pendulous	Tolerant	.....		
Eucommia ulmoides, Hardy Rubber	60	Oval	Tolerant	O	.....	Resemble Hackberry leaves
Euonymus americanus, Brook Euonymus	8	Upright	Moist shade	Greenish	Scarlet, warty	Known for its fruits
atropurpureus, Wahoo	20	Shrubby	Moist	Purple	Pomegranate purple	
bungeanus, Winterberry E.	15	Loose	Ordinary	Yellowish	Rose	Informal growth
europaeus, European Burningbush	20	Upright	Sun	Yellowish	Pink	Better growth than E. americanus
latifolius, Broadleaf B	20	Upright	Ordinary	Greenish	Red	Broad leaves
Euptelea polyandra	45	.....	Loamy, moist	O	Like Hornbeam	Hornbeamlike leaves and fruits
Fagus americana, American Beech	60	Oval	Rich, limey	O	Prickly capsule	
sylvatica, European B.	90	Round	Rich, limey	O	Prickly capsule	More compact than American B.
Franklinia alatamaha, Franklinia	30	Upright	Moist, peaty	White	Woody	A rare tree, flowers large
lasianthus, Loblolly-bay	50–60	Upright	Swamps, acid	White	Woody	Grown in South
Fraxinus americana, White Ash	120	Long oval	Tolerant	O	Winged	Good street tree
excelsior, European A.	90–100	Broad	Limestone	O	Winged	Good in cultivation
nigra, Black A.	60–80	.....	Swampy	O	Winged	Lumber for many uses
ornus, Flowering A.	25	Rounded	Loam	Greenish	Winged	
pennsylvanica, Red A.	30–70	.....	Rich	O	Winged	
quadrangulata, Blue A.	120	.....	Limestone	O	Winged	Winged twigs
Ginkgo biloba, Maidenhair-tree	120	Upright	Tolerant	O	Yellow	Fan-shaped leaves
Gleditsia triacanthos, Honeylocust	140	Broad	Rich	White	Brown pods	Thornless variety is good city tree
Grevillea robusta, Silk-oak	150	.....	Dry	Orange	.....	Very rapid growth in semi-tropics
Gymnocladus dioica, Kentucky Coffeetree	100	Broad	Rich	Greenish	Brown pods	
Halesia diptera, Two-wing Silverbell	30	Shrubby	Loam	White	2-winged	Bell-shaped flowers
monticola, Mountain Silverbell	90	Pyramid	Loam	White	4-winged	Bark peels like Shagbark Hickory
tetraptera, Great Silverbell	30	Irregular	Loam, acid	White	4-winged	The commoner sort

Scientific Name	Common Name	Height in feet	Shape	Soil	Color of flowers	Fruit	Remarks
Hicoria alba,	Mockernut	90	Broad	Loam	O	Thick, hard	Small kernel
cordiformis,	Bitternut	70	Broad	Loam	O	Small	Bitter nut
glabra,	Pignut	40	Broad	Loam	O	Fig-shaped	Bitter nut
laciniosa	Shellbark Hickory	60–80	Narrow	Rich, wet	O	Pointed on both ends	Sweet and edible nuts
Hicoria ovata,	Shagbark Hickory	120	Broad	Light, loam	O	Angular, flattened	Sweet and edible nuts
pecan,	Pecan	150	Oval	Loam	O	Oval	Popular in Southern States
Hippophae rhamnoides,	Sea-buckthorn	30	Upright	Damp	Yellowish	Orange	Showy berries
Hovenia dulcis,	Raisintree	30	Broad	Sandy loam	White	Sweet, edible	Bark like Silver Maple
Ilex aquifolium,	English Holly	75	Pyramid	.....	O	Red	
cassine,	Dahoon	30	Shrubby	Acid	.....	Red	Not hardy in North
cornuta		9–18	Pyramid	.....	O	Red	
monticola,	Mountain Winterberry	30	Shrubby	.....	O	Red, purple	Not evergreen
opaca	American Holly	45	Pyramid	Acid	O	Red	Common Christmas holly
vomitoria,	Yaupon	25	Shrubby	.....	O	Red	Not hardy
Jacaranda cuspidifolia,	Green-ebony	30	Oval	Tolerant	Blue violet	O	For South
ovalifolia		50	Oval	Tolerant	Blue	O	For South
Juglans californica,	California Black Walnut	25	Shrubby	Well drained, fertile loams	O	Globular	Less hardy
cineria,	Butternut	90	Broad		O	Long oval	Hardy
nigra,	Black Walnut	150	Round		O	Globular	Hardy
regia,	Persian Walnut	90	Broad		O	Flattened globular	Less hardy
rupestris,	Mexican Walnut	30	Shrubby		O	Globular	Less hardy
sieboldiana,	Japanese Walnut	60	Broad, round		O	Globular	Less hardy
Koelreuteria paniculata,	Goldenrain-tree	30	Irregular	Dry	Yellow	Bronze pods	Splendid small tree
Laburnum alpinum,	Scotch Golden-chain	30	Upright	Cool	Yellow	O	Hardier than L. anagyroides
anagyroides,	Golden-chain	20	Upright	Cool	Yellow	O	Excellent small tree
Lagerstroemia indica,	Crapemyrtle	10–20	Oval	Tolerant	Pink, purple, white	O	Popular in South as a flowering tree
Leitneria floridana,	Corkwood	18	Open, loose	Peaty	O	O	Wood extremely light in weight
Leucadendron argenteum,	Silvertree	30	Shrubby	.....	O	Broad nut	Silvery leaves, for South
Liquidambar formosa,	Formosa Sweetgum	75	Pyramid	Rich	O	Spiny ball	
stryraciflua,	Sweetgum	135	Pyramid	Rich	O	Spiny ball	Turns wonderful red in Fall
Liriodendron tulipifera,	Tuliptree	150	Long oval	Rich	Yellow	Cone-like	
Maackia amurensis,	Amur Maackia	45	Round	Rich	White	O	Related to Yellow-wood
chinensis,	Chinese Maackia	70	Round	Rich	White	O	
Maclura pomifera	Osage-orange	60	Shrubby	Tolerant	O	Green	Prickly, common for hedges
Magnolia acuminata,	Cucumbertree	90	Pyramid	Rich	Greenish	Red	Fruits resemble a cucumber
denudata,	Yulan Magnolia	45	Round	Rich	White	Red	Blooms early
fraseri,	Fraser M.	30–40	Spreading	Rich	White	Rose	Tender in extreme cold
grandiflora,	Southern M.	90	Pyramid	Rich	White	.....	Good in Kentucky and Southward
hypoleuca,	Silver M.	90	Pyramid	Rich	White	Scarlet	Similar to M. tripetala

macrophylla, Bigleaf M.	45	Oval	Rich	Creamy white	Rose	Leaves often 30 in. long
salicifolia, Anise M.	30	Slender	Rich	White	.....	Narrower leaves than usual
soulangeana, Saucer M.	20	Shrubby	Rich	Various	.....	Numerous popular varieties
stellata, Star M.	12	Shrubby	Rich	White	.....	Blooms early
tripetala, Umbrella M.	36	Crooked	Swampy	White	Rose	Large flowers, 7 to 10 in. across
Magnolia virginiana, Sweetbay	24–80	Shrubby often	Swampy	Lemon	Red	Half-evergreen
watsoni, Watson M.	25	Shrubby	Rich	White	.....	Crimson stamens and pistils
Malus, Crab, Apple						See page 277
Melia azedarach, Chinaberry	30–40	Round	Warm loam	Lilac	Yellow berry	Flowers like Catalpa
var. umbraculiformis, Texas Umbrella-tree	20	Umbrella-like	Warm loam	Lilac	Yellow berry	Street tree in California
Morus alba, White Mulberry	45	Round	Rich	O	White to purple	The silkworm tree
rubra, Red M.	45	Round	Rich	O	Red to purple	Great tree for birds
Nyssa sylvatica, Tupelo	60	Broad, flat top	Wet	O	Blue black	Turn attractive red in Fall
Ostrya virginiana, Hophornbeam	60	Oval	Dry	O	Hoplike	Somewhat Elm-like
Oxydendrum arboreum, Sourwood	15–75	Oval	Acid	White	Gray capsules	Leaves like those of a Peach
Paliurus aculeatus, Christ-thorn	20	.....	Well drained	Yellow-green	Flat, papery	Twigs spiny, tender
Parkinsonia aculeata, Jerusalem-thorn	10	Shrubby	Dry	Yellow	.....	For frostfree areas
Paulownia tomentosa, Royal Paulownia	45	Round	.....	Violet	Capsules	Like Catalpa
Phellodendron amurense, Amur Corktree	45	Broad	.....	Yellowish	Black drupes	Like Ailanthus
sachalinense, Sakhalin C.	45	Broad	Dry	Yellowish	Black drupes	
Planera aquatica, Water-elm	20	Broad	Swamps	O	O	Elm-like tree
Platanus acerifolia, London Planetree	100	Broad, round	Tolerant	O	Balls	One of best city trees
occidentalis, American P.	120	Broad, round	Moist	O	Balls	Large native tree
orientalis, Oriental P.	90	Broad, round	Tolerant	O	Balls	Good city tree
racemosa, California P.	90	Compact	Tolerant	O	Balls	Native of Pacific Coast
Poinciana regia, Royal Poinciana	30-40	Spreading	Loam	Orange scarlet	Pods	Glorious sub-tropical tree
Populus acuminata, Smoothbark Cotton-wood	45	Spreading	Tolerant	O	O	Narrower leaves than most others
alba, White Poplar	60	Irregular	Poor	O	O	White leaves and twigs
angustifolia, Narrowleaf Poplar	60	Spreading	Tolerant	O	O	A narrow leaf sort
balsamifera, Balsam P.	90	Ascending	Tolerant	O	O	Buds have strong odor
candicans, Balm-of-Gilead P.	90	Spreading	Tolerant	O	O	Buds have strong odor
eugenei, Carolina P.	80	Upright	Rich, moist	O	O	A true tree pest
fremonti, Fremont P.	90	Broad	Tolerant	O	O	Good in Southwest
grandidentata, Largetooth Aspen	60	Narrow, round	Tolerant	O	O	Suckers freely
laurifolia, Petrovski P.	45	Spreading	Dry	O	O	Very hardy
nigra italica, Lombardy P.	100	Columnar	Tolerant	O	O	Needed for accents
simoni, Simon P.	36	Spreading	Tolerant	O	O	
tremuloides, Quaking Aspen	90	Spreading	Tolerant	O	O	Suckers too freely
trichocarpa, Western Balsam P.	180	Spreading	Tolerant	O	O	Grows on Pacific Coast
Prosopis glandulosa, Mesquite	9–20	Shrubby	Arid	Greenish	Sickle-shaped	Forage in arid regions
Prunus americana, Wild Red or Yellow Plum	35	Spreading	Heavy	White	Red or yellow	A native Plum
(Amygdalus) persica, Purpleleaf Peach	18	Upright	Sandy	Pink, red	Yellow, green	Beside purpleleaves also redflowered sorts

Scientific Name	Common Name	Height in feet	Shape	Soil	Color of flowers	Fruit	Remarks
Prunus americana—continued							
cerasifera pissardii	Purpleleaf Plum	35	Upright	Heavy	White	Purple	Commonest purple Plum
maritima	Beach Plum	8–15	Spreading	Sand	White	Purple	For seacoast
serotina	Wild Black Cherry	100	Broad	Heavy	White	Black	
serrulata	Oriental Cherry	75	Upright		Rose to white	Black	
sieboldi	Siebold Cherry	15	Erect		Pink, white		See page 306 for varieties
Prunus subhirtella	Higan Cherry	30	Pendulous and erect forms		Pink, white		Semi-double and double flowers
tomentosa	Nanking Cherry	5	Shrubby		Pink	Black	Includes splendid weeping sort
yedoensis	Yoshino Cherry	45	Broad		White	Red	Extremely hardy
Pseudotsuga taxifolia	Douglas	20	Pyramidal	Moist	Pale pink	Black	Popular flowering Cherry
Pterostyrax hispida	Epaulette tree	45	Open	Moist sand	Greenish	Green	Odor of Hops when twigs are broken
Quercus alba	White Oak	95	Spreading	Rich sandy	Cream	Winged	Unusual flower clusters
bicolor	Swamp Oak	75	Broad	Deep sand	O	Acorns	Lighter bark than other oaks
coccinea	Scarlet Oak	75	Pyramidal	Rich, sand	O	Acorns	Brilliant, deep cut leaves
macrocarpa	Mossycup Oak	75	Open	Rich	O	Acorns	Fringed acorns
marilandica	Blackjack Oak	35	Irregular	Dry sand	O	Acorns	Brown shiny twigs
nigra	Water Oak	75	Rounded	Loam	O	Acorns	Acorns ripen in 16 years old
palustris	Pin Oak	75–120	Pyramidal	Rich moisture	O		Hardwood for furniture
prinus	Swamp Oak	60	Conical	Sandy loam	O		Transport easily. Popular
prinoides	Chinquapin Oak	5–15	Spreading	Loam	O		Half evergreen in South
prinus	Chestnut Oak	100	Broad	Deep	O		Deep green leaves
rubra	Red Oak	75–90	Irregular	Loam	O		Crimson leaves
rubra	Red Oak	75–90	Broad	Gravelly clay	O		Leaves shorter than other. Many varieties
virginiana	Live Oak	90	Horizontal	Moisture	O	Shallow cup	Evergreen
Rhododendron maximum		5	Dense		Green, purple	Green, purple	Evergreen
glaucum	Sweet Azalea	8–15	Irregular	Peat	Green, white	Green, purple	Misty masses of flower and fruit stems
lutea	Exquisite Azalea	10	Irregular	Peat	Green, white	Green, purple	For naturalistic plantings
periclymenoides	Pinkster Azalea	10	Irregular	Peat	Green, white	Green, purple	For naturalistic plantings
Robinia pseudoacacia	Locust	8	Irregular	Dry sand	White	Green, purple	Very hardy
viscosa	Clammy Locust	40	Irregular	Dry sand	Rose	Green	Suckers freely, varies in habit
pseudoacacia	Common Locust	75	Columnar	Dry sand	Rose	Green	Interesting small tree
viscosa	Clammy Locust	40	Columnar	Dry sand	Rose	Green	Suckers freely, varies in habit
Salix alba	White Willow	75	Columnar	Loam	Rose	Green	Interesting small tree
babylonica	Babylon Weeping Willow	35	Irregular	Moist			Very hardy
caprea	Pussy Willow	35	Weeping	Loam			Varieties with bright red and yellow twigs
fragilis	Crack Willow	35	Weeping	Loam			Popular and commonly grown
lucida	Shiny Willow	25	Irregular	Loam			Bright copper twigs
pentandra	Bay Willow	35	Irregular	Moist			Good foliage
purpurea	Purple Willow	15	Irregular	Moist	Purple		Commonly grown
vitellina	Golden Willow	40	Broad	Moist	Purple		Commonly grown
vitellina	Golden Weeping Willow	35	Weeping	Moist			Commonly grown
vitellina	Golden Weeping Willow	35	Weeping	Moist			Commonly grown
vitellina	Golden Weeping Willow	35	Weeping	Moist			Commonly grown
vitellina	Golden Weeping Willow	35	Weeping	Moist			Commonly grown

Sassafras variifolium, Sassafras	50	Broad	Sandy loam	O	Blue-black	Difficult to transplant
Schinus molle, Peppertree	30	Broad, quite weeping	Tolerant	O	Rose	Splendid in California
Sophora japonica, Chinese Scholartree	75	Round	Tolerant	Cream	Pea-like	Street tree
Sorbus americana, American Mountain ash	30	Round	Loam, acid	White	Red pomes	Renowned for beauty of flower and fruits both here and Europe
Sorbus aucuparia, European M	45	Round	Loam	White	Red pomes	
Sterculia acerifolia, Victorian Bottletree	60	Broad	Loam	Scarlet	Black	Semi-tropical shade tree
diversifolia, Black Kurrajong	60	Spreading	Loam	Yellowish	Long dry pod	Grown in warmer parts of Florida
platanifolia, Chinese Parasoltree	50	Round	Loam	Greenish	Long dry pod	Leaves like Planetree
Stewartia pentagyna, Mountain Stewartia	15	Shrubby	Peaty	White	O	Superb flowering tree
pseudocamellia, Japanese S	10-30	Shrubby	Rich	White	O	Flowers resemble Camellia
Styrax japonica, Japanese Snowbell	10-30	Horizontal branches	Well-drained	White	O	Very compact beautiful flowered trees
obassia, Fragrant S	50	Ascending	Well-drained	White	O	Resembles Magnolia in growth
Syringa amurensis, Amur Lilac	12	Upright	Loam	Yellowish	O	Bark like Cherry
var. japonica, Japanese L	30	Round	Loam	White	O	Handsome for late flowers
var. pekinensis, Peking L	15	Spreading	Loam	Yellowish	O	Larger clusters than others
Tilia americana, American Linden	120	Rounded	Rich	White		
cordata, Littleleaf European L	30	Dense		White		Small leaves
euchlora, Crimean L	60	Somewhat pendulous		White	Curious wing attached to cluster of fruits	Lustrous leaves
heterophylla, Beetree L	50-60	Rounded	Limestone	White		Leaves white beneath and woolly
platyphyllos, Bigleaf European L	120	Pyramid		White		Leaves hairy beneath
tomentosa, Silver L	60	Broad pyramid	Good	White		Leaves white beneath
vulgaris, Common Linden	120	Globular	Good	White		
Ulmus americana, American Elm	120	Vase shaped	Moist loam	O	Winged	Queen of American trees
foliacea, Smoothleaf E	60	Varies	Loam	O	Winged	Many varieties, see page 349
fulva, Slippery E	60	Flat topped	Rich loam	O	Winged	First American boy's chewing gum
glabra, Scotch E	120	Oak-like	Moist loam	O	Winged	Smooth bark until some age
parvifolia, Chinese E	45	Broad	Tolerant	O	Winged	Widest range of usefulness
pumila, Dwarf Asiatic E	45	Broad	Tolerant	O	Winged	Small leaves
racemosa, Rock E	120	Oblong	Loam	O	Winged	Twigs with corky angles
Ungnadia speciosa, Texas buckeye	30	Shrubby	Loam	Pink	Leathery capsules	Uncommon trees related to Buckeye
Xanthoceras sorbifolia, Chinese Flowering-chestnut	25	Upright	Porous	White	Large capsules	A neat small shrublike tree
Xanthophyllum americanum, Prickly ash	25	Shrubby	Well-drained	Yellowish	Black	Spiny shrublike tree with compound leaves
Zelkova serrata, Sawleaf Zelkova	90	Round	Loam	O	O	Elmlike tree with Beechlike bark

CONIFEROUS EVERGREENS

Scientific name	Common name	Height in feet	Shape	Soil	Type of foliage	Color of foliage	Remarks
Abies balsamea, Balsam Fir		75	Narrow pyramid	Good, moist	Flat needles	Dark green	Not good in cultivation
cephalonica, Greek F.		100	Pyramid	Good, moist	Sharp pointed	Green above	Good south of New York State
cilicica, Cilician F.		100	Pyramid	Good, moist	Notched tips	Green above	Good in New England
concolor, White F.		120	Pyramid	Poor in wet	Rounded tips	Bluish green	Tolerates heat and drought
[illegible]		90	Pyramid	Good, moist	Sometimes sharp	Bright green	Good in Massachusetts
[illegible]		90	Pyramid	Good, moist	Rounded or notched	Dark green above	Hardy except extreme North
lasiocarpa, Alpine F.		90	Conical	Good, moist	Rounded or pointed	Bluish green	Not good in Eastern States
var. arizonica, Arizona F.		90	Conical	Good, moist	Rounded or pointed	Steel blue	Bark corky, thick
nordmanniana, Nordmann F.		150	Broad pyramid	Even poor	Rounded or notched	Dark green	Good in city. Plant in protected place
pectinata, Silver F.		150	Open growth	Good, moist	Rounded or notched	Dark green	Good except in coldest states
[illegible]		75	Slender	Good, moist	Straight tip or notched	Dark green	Irregular growth. Rapid
Araucaria bidwilli, Bunya bunya		150	Pyramid		Needle	Dark green	Withstands some frosts
[illegible]		160-200	Pyramid	Clay	Needle	Bright green	Grown in California and subtropics
imbricata, Monkeypuzzle		90	Unique		Stiff, spiny	Bright green	Too odd to be truly beautiful
Cedrus atlantica, Atlas Cedar		120	Pyramid		Needles in clusters	Blue and gray green	Open growth when young. Excellent
deodara, Deodar		150	Pyramid	Tolerant	Needles in clusters	Blue green	Good on Pacific Coast
libanotica, Cedar of Lebanon		120	Wide pyramid	Needs good	Needles in clusters	Dark green	Grow to great age
Cephalotaxus drupacea, Plum yew		30	Shrubby		Flat	Dark green	Like a broad leaf Yew
fortunei, Chinese P.		30	More treelike		Flat	Dark green	More popular in cultivation
Chamaecyparis lawsoniana, Lawson Cypress		180	Pyramid		Appressed	Green or gray	Handsome Pennsylvania southward
nootkatensis, Nootka C.		120	Narrow pyramid	Moist	Appressed	Dark green	Hardier than Lawson C.
obtusa, Hinoki C.		120	Broad pyramid	Dislikes lime	Closely appressed	Dark green, white lines below	Splendid Japanese sort
pisifera, Sawara C.		150	Pyramid	Loam	Appressed	Dark green, white lines below	For varieties see page 370
thyoides, Whitecedar		75	Narrow pyramid	Swamp, acid	Appressed	Dark blue or green	Not ornamental
Cryptomeria japonica, Cryptomeria		150	Narrow pyramid		Awl-shaped	Dark green	Accent among other evergreens
Cunninghamia lanceolata, China-fir		75	Broad pyramid		Wide awl-shape	White lines beneath	Rare, not unlike Araucaria
Cupressus arizonica, Arizona C.		40	Pyramid or column	Dry	Awl-shape	Gray green	For the South
macnabiana, Macnab C.		35	Shrubby		Blunt awl-shape	Gray green	Hardiest Cupressus
macrocarpa, Monterey C.		75	Pyramid		Rhombic	Dark green	For the South
sempervirens, Italian C.		75	Narrowest column		Appressed	Darkest green	Popular in South
Juniperus chinensis, Chinese Juniper		60	Columnar	Loam neutral	Sharp and appressed	Dark green	See varieties, page 377
communis, Common J.		25	Various	Moist	Awl-shape	White band beneath	See varieties, page 378
drupacea, Syrian J.		60	Column or pyramid	Lime	Sharp	Two white bands beneath	Similar foliage to Common J.
formosana, Formosa J.		35	Column		Sharp	Two white bands above	Pendulous twigs

Juniperus scopalorum, Colorado J.	35	Column	.....	Sharp, appressed	Green or dark green	Splendid in Rocky Mountain regions
virginiana, Redcedar	90	Various	Sandy	Scaly and sharp	Gray above	See varieties, page 379
Larix europaea, European Larch	100	Pyramid	Sandy	Flat, in clusters	Bright green	Sheds leaves in Fall; although these are conifers, they are not evergreens
laricina, American L.	60	Pyramid	Swamp	Flat, in clusters	Blue green	
leptolepis, Japanese L.	45	Pyramid	Loam	Flat, in clusters	Blue green	
Libocedrus decurrens, Incense cedar	135	Column	.....	Scalelike	Bright green	Resembles Arborvitae
Picea alcockiana, Alcock Spruce	80-150	Cone	.....	Ridged on both sides	Dark green, silver beneath	Splendid in Eastern States
canadensis, White S.	90	Cone	Cool, moist	Sharp, needlelike	Blue to light green	Very hardy
engelmanni, Engelmann S.	150	Dense pyramid	Clay loam	Slender	Blue green	Very hardy
excelsa, Norway S.	150	Pyramid	Moist	Rather short	Dark green	Common, but not as good as others
omorika, Serbian S.	90	Narrow pyramid	Moist, rich	Flat	Silvery above	Good in Eastern States
orientalis, Oriental S.	120	Compact pyramid	Rich loam	Stout, straight	Dark green	Short needles, very worthy
polita, Tigertail S.	90	Pyramid	Rich, moist	Very ferocious	Bright green	Rigid, sharp leaves
pungens, Colorado S.	90	Pyramid	Tolerant	Rigid, sharp	Gray or blue green	Varieties are Blue Spruces
Pinus cembra, Swiss Stone Pine	75	Pyramid	Poor	5 needles	Dark green	Very slow growth
densiflora, Japanese P.	100	Irregular	.....	2 needles	Blue green	Bushy, dense
var. umbraculifera, Japanese Umbrella P.	..	Round or flat	.....	2 needles	Blue green	For formal effects
excelsa, Himalayan P.	150	Pyramid	.....	5 needles	Blue or gray green	Long, drooping needles
flexilis, Limber P.	45-75	Pyramid	Sandy loam	5 needles	Yellow green	Almost shrub in North
montana, Swiss Mountain P.	10-35	Shrubby	Stony, dry	2 needles	Bright green	Informal effects
nigra, Austrian P.	90	Irregular	Limestone	2 needles	Dark green	Coarse, easily grown
palustris, Longleaf P.	120	Open head	.....	3 needles	Dark green	Needles 8-18 inches long
ponderosa, Western Yellow P.	150	Spreading	Tolerant	3 needles	Dark green	Strong growing
resinosa, Red P.	75	Broad	Tolerant	2 needles	Dark green	Leaves soft to touch
rigida, Pitch P.	75	Irregular	Poor	3 needles	Dark green	Old trees picturesque
strobus, White P.	90	Pyramid	Loam	5 needles	Blue green	Leaves soft to touch
sylvestris, Scotch P.	75	Irregular	Acid	2 needles	Blue green	Resists cold and wind
Podocarpus macrophylla, Yew Podocarpus	60	Short branches	Loam	Flat, long-narrow	Dark green	Wider leaves than Yew
nagi, Japanese P.	60	.....	.....	Flat, elliptical	Dark green	Grown in S. California and Florida
Pseudolarix amabilis, Goldenlarch	120	Broad pyramid	Dislikes lime	Flat, in clusters	Pale green	Leaves wider than Larch
Pseudotsuga douglasi, Douglas-fir	300	Pyramid	Moist	Flat	Dark or blue green	Somewhat like a Fir
Sciadopitys verticillata, Umbrella-pine	120	Narrow pyramid	Deep, moist	Whorled	Dark green	Leaves in umbrellalike whorls
Sequoia gigantea, Giant Sequoia	300	Pyramid when young	Cool climate	Appressed, sharp	Bright green	Native of Sierra Nevadas
sempervirens, Redwood	300	Pyramid when young	Cool climate	Flat, sharp	Bright green	Noted Pacific Coast trees
Taxodium distichum, Baldcypress	150	Pyramid	Swamps	Flat, soft	Light green, pale beneath	Not evergreen. Wants neutral soil
Taxus baccata, English Yew	60	Broad, round	Rocky	Flat gradually pointed	Dark green	Not as hardy as Japanese Yew
cuspidata, Japanese Yew	50	Upright, spreading	Rocky	Flat, abruptly pointed	Dark dull green	One of most useful evergreens
media	..	Upright or columnar	Rocky	Flat, abruptly pointed	Dark green	A hybrid of recent origin

[illegible]	[illegible]	[illegible]	Shape	Size	Type of Foliage	Color of Foliage	Remarks
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	20	Pyramidal	Medium	Aggressive	[illegible] green	[illegible]
[illegible]	[illegible]	15	[illegible]	Large	Aggressive	Bright green	Long-pointed pendent leaves
[illegible]	[illegible]	[illegible]	Round-topped and [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	25	Pyramidal	Medium	Aggressive	Bright green, [illegible]	[illegible]
[illegible]	[illegible]	15	Pyramidal	Very large	Aggressive	Dark green, [illegible]	Long-pointed pendent leaves; [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Flat, [illegible]-shaped	Dark green	Not easily [illegible]
[illegible]	[illegible]	40	[illegible]	[illegible]	Flat, quite pointed	Light green	Hardy to Massachusetts
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Flat, like [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	35	[illegible]	[illegible]	Flat, slightly [illegible]	[illegible]	Good to [illegible] shade
[illegible]	[illegible]	30	Pyramidal	Large	Flat, [illegible]	[illegible]	Hardier and more compact
[illegible]	[illegible]	25	Pyramidal	Medium, small	Flat, [illegible]	[illegible]	[illegible]
[illegible]	Japanese H	20	Pyramidal	Large	Crinkled, [illegible]	[illegible]	Leaf [illegible]
[illegible]	[illegible] H	35	Pyramidal	Large	Crinkled	[illegible]	Leaf [illegible]

Arbor Days

Arbor Day is observed throughout the country as follows:

Alabama.....Proclamation of the Governor.
Arizona.....In 5 northern counties, Friday following first of April; elsewhere Friday following first of February.
Arkansas.....First Saturday in March.
California.....March 7, birthday of Luther Burbank.
Colorado.....Third Friday in April.
Connecticut....Latter part of April or first part of May by Proclamation of Governor.
Delaware.....April by proclamation of Governor.
Dist. of Col.....Third Friday in April by proclamation of Commissioners.
Florida.....First Friday in February.
Georgia.....First Friday in December.
Hawaii.....First Friday in November.
Idaho.....April 29, when possible, recommended by Governor.
Illinois.....Proclamation of Governor in April.
Indiana.....Second Friday in April.
Iowa.....Proclamation of the Governor.
Kansas.....Option of Governor.
Kentucky.....In Fall by proclamation of Governor.
Louisiana.....Second Friday in January; resolution State Board of Education.
Maine.....Option of Governor, in the Spring.
Maryland.....Second Friday in April, proclamation of Governor.
Massachusetts..Last Saturday in April, proclamation of Governor.
Michigan.....Proclamation of Governor. Usually last Friday in April.
Minnesota.....Proclamation of Governor, usually latter part of April.
Mississippi.....Second Friday in December. Proclamation by Governor.
Missouri.....First Friday after first Tuesday in April.
Montana.....Second Tuesday in May.
Nebraska.....April 22.
Nevada.....Proclamation of Governor.
NewHampshire.Proclamation of Governor, early May.
New Jersey.....Second Friday in April.
New Mexico....Second Friday in March; proclamation of Governor.
New York.....See footnote.
North Carolina..Friday after March 15.
North Dakota..Option of Governor.
Ohio.....Proclamation of Governor.
Oklahoma.....February 22.
Oregon.....Western, second Friday in February; Eastern, second Friday in April.
Pennsylvania...Proclamation of Governor.
Porto Rico.....Last Friday in November.
Rhode Island...Second Friday in May.
South Carolina..Third Friday in November.
South Dakota....No law, generally observed in April throughout State.
Tennessee.....First Friday in April.
Texas.....February 22.
Utah.....April 15 by statute.
Vermont.....Option of Governor, usually Friday of Forest Week.
Virginia.....Proclamation of the Governor in the Spring.
West Virginia...Usually second Friday in April.
Wisconsin.....Proclamation of Governor. Usually first Friday in May.
Washington.....Proclamation of Governor. Usually first Friday in May.
Wyoming.....Proclamation of Governor. Usually first Friday in May.

Note: The law in New York State is very elastic in respect to Arbor Day and permits of naming the date sectionally so as to take full advantage of climatic conditions in different parts of the State. Hence, there are three Arbor Days in New York, one for Long Island, one for "up-State," and one for the northern counties. As a rule, the last Friday in April and the first two Fridays in May are the dates selected.

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